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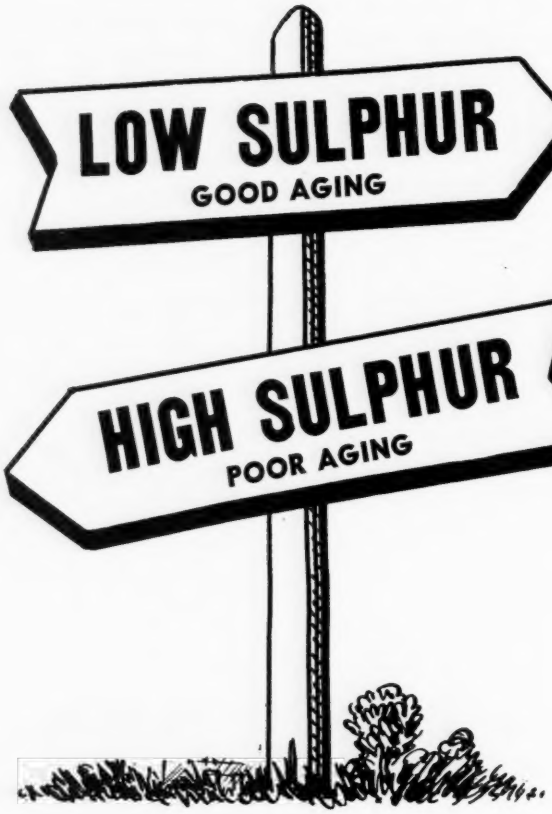


The
HIGH ROAD
to the FUTURE

The
LOW ROAD
of the PAST

WHICH WAY ARE YOU GOING?

WHY DO LABORATORY WORK

ALONG THE LOW ROAD?

★

R. T. VANDERBILT CO., Inc.
230 PARK AVENUE, NEW YORK, N. Y.

INDIA RUBBER WORLD

Published at 420 Lexington Avenue, New York, N. Y.

Volume 100 **New York, April 1, 1939** **Number 1**

Manufacture of Rubber Hose for Industrial Service-I

M. Berman[1]

IN THIS modern age of technical progress and development the uses of rubber hose have become more extensive and diversified than ever before. In the early days of hose manufacture when the requirements of industry and commerce were much simpler than those of today, the types of rubber hose produced were comparatively few in number and fully ample for the demands of the service.

With development of new processes and of more powerful mechanical equipment in industry, however, there has come a gradual increase in the severity of the technical and commercial requirements of rubber hose. Consequently improved compounds, new construction features, and better methods of manufacturing rubber hose had to be developed by the chemists and engineers of the rubber industry to meet the imperative need of greater durability and economy.

We are here undertaking the task of describing in a simple manner, free from complicated technical explanations, but with the aid of photographs and diagrams, the manufacture of rubber hose for industrial service. This discussion will cover the art of compounding rubber, the processes of mixing and calendering, the frictioning and cutting of fabric reenforcements, the production of rubber tubes on the extruding machine, and finally the manufacture and vulcanization of the many varieties and combinations of hose construction.

The Art of Compounding

In recent years, through the experimental work of chemists, physicists, and engineers, real progress has been made in the development of the art of rubber compounding. We maintain organized research and testing laboratories in which highly trained chemists and engineers study new materials and their performance in rubber mixtures. These rubber compounds are subjected to physical and chemical tests and to accelerated performance tests based on the actual service requirements of the materials.

Out of the vast amount of experimental work done on compounding ingredients for rubber there has been developed a comparatively limited number of standard materials, which are in common use today and which have been selected by rubber chemists for the special properties they impart to a rubber compound. These compounding materials may be subdivided into eight broad classifications:

1. Vulcanizing Agent: Sulphur.
2. Active Reenforcing Materials: Carbon Black, Clays, Zinc Oxide, Etc.
3. Fillers (which are relatively inert): Barytes, Whiting, Asbestine, Slate Flour, Etc.
4. Colors: Zinc Sulphide, Lithopone, Titanium Oxide, Iron Oxide, Crimson Antimony, Ultramarine Blue, Organic Dyes, Etc.
5. Plasticizers and Softeners: Resins, Oils, Waxes, Asphaltic or Petroleum Hydrocarbons.
6. Organic Accelerators: Chemical materials which reduce the time of vulcanization and manufacturing costs without adversely affecting quality.
7. Antioxidants and Sunlight Resisters: Chemical materials which aid rubber in resisting oxidation and ultra-violet rays of the sun, thereby increasing the life of rubber.
8. Reclaimed Rubber: Made from old tires and tubes by treatment with steam and alkali solution under high steam pressure; a valuable compounding ingredient for many purposes.

A typical rubber compound or recipe having qualities of high tensile strength and abrasive resistance is tabulated at the top of the next page with an explanation as to the reasons for inclusion of each ingredient in the mixture. This compound, when properly vulcanized, has a tensile strength of over 4,000 pounds per square inch, a phenomenal increase over unvulcanized crude rubber which

[1] Technical superintendent, Hewitt Rubber Corp., Buffalo, N. Y.

1 2 3 4 5 6 7 8 9

Proportions shown are actual by weight. Carbon black, because of its fine particle size and light specific gravity occupies considerable volume. No other material known has as great a reenforcing effect on rubber as carbon black.

	Ingredient	Amount—Lbs.	Reason for Inclusion in Compound
1	Smoked Sheet Rubber	60.00	Smoked sheets are used for toughness, uniformity, and highest resistance to abrasion.
2	Pine Tar	1.00	For tack and smooth processing.
3	Carbon Black	31.00	To give high tensile strength and resistance to abrasion.
4	Zinc Oxide	3.50	To activate the accelerator.
5	Stearic Acid	1.00	To activate the cure.
6	Phenyl-beta-napthylamine	0.60	A strong antioxidant and heat resistant material for improving aging qualities of rubber.
7	Mercaptobenzothiazole	0.50	Organic accelerator for speeding up the cure.
8	Sunproof	0.60	To resist deterioration by ultra-violet rays of the sun.
9	Sulphur	1.80	For vulcanization.
	Total	100.00	

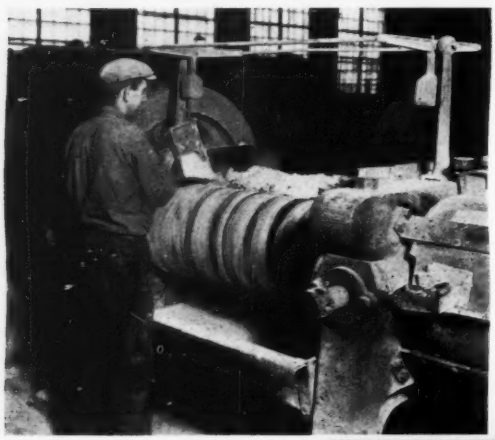


Fig. 1. Mixing Rubber Batch on Mill

has a tensile strength of less than 300 pounds per square inch.

Mixing

Crude rubber is plasticized and mixed with reenforcing and vulcanizing ingredients on a motor - driven mill (Figure 1) which consists of two adjacent chilled iron rolls of smooth surface, approximately 20 inches in diameter by 60 inches long, set in a heavy steel frame. The rolls are geared for differential speeds and revolve in opposite directions toward each other (Figure 2).

The mixing operation is carried out according to definite specifications. The rubber portion of the recipe is first placed on the mill and is torn and kneaded between the revolving rolls which are adjusted with the proper opening to form a bank of rubber at the bite of the rolls. In a few minutes the rubber becomes soft and plastic and clings to one of the rolls in a smooth sheet about ½-inch thick. The rubber is now ready to absorb the powdered ingredients which are gradually added by the operator, and the mixing is continued until the masticated rubber has absorbed all the material. The sheet of rubber is then cut and rolled back and forth on the mill a given number of times until the whole mass is uniform. It is now cut from the mill in slabs, cooled in water, and is ready for further operations, such as calendering, tubing, etc. At this point certain important control tests on each rubber batch are run to make sure that our compounding and mixing have been correctly performed.

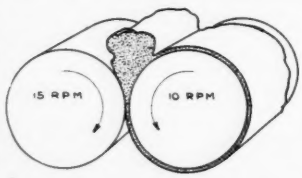


Fig. 2. Premasticating Crude Rubber on Revolving Mill Rolls

Fig. 3. Running Rubber Hose Cover Stock on Gum Calender

Calendering

The calender con-

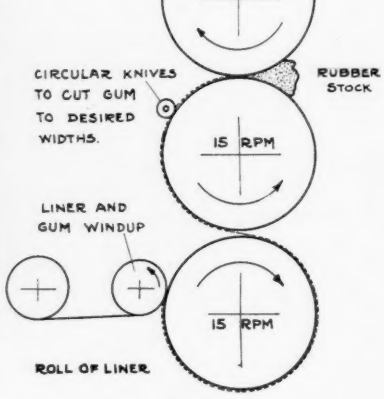


Fig. 4. Cutting Gum on Calender for Hose Covers

sists of three heavy chilled iron rolls, usually 22 inches in diameter by 60 inches long, set parallel to each other and revolving in opposite directions.

When used for producing *sheet rubber* for making hose covers, etc., it is called a gum sheeting calender. In this operation the individual rolls run at the same speed. By feeding the soft rubber stock into the space between the two upper rolls, it is calendered out into a smooth sheet of gum of the required thickness by accurately regulating the distance between the rolls. (Figures 3 and 4.) When used for hose covers, the calendered sheet gum is simultaneously cut into strips of the proper width by means of circular knives placed at intervals against the metal calender roll. To keep the rubber strips from sticking to each other they are wound in cloth or "liners" to separate them. They are now ready for application as the outer cover on hose.

When used for frictioning or impregnating cotton duck with rubber, the calender rolls run at differential speeds.

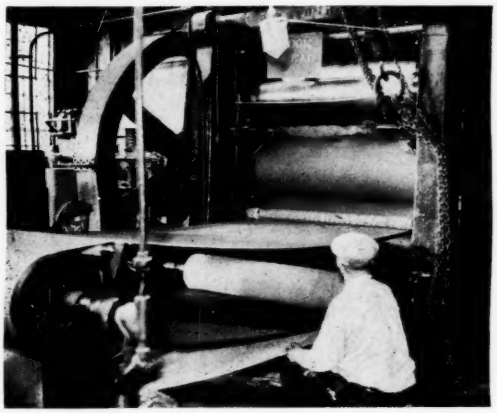


Fig. 5. Rubberizing Cotton Duck on Friction Calender

The duck is passed between the lower two rolls (Figure 5) without crushing the fabric, and the soft rubber is forced into and around the threads of the cotton duck. The speed differential of the rolls causes a smearing action of the plastic rubber on the fabric, which, together with the pressure between the rolls, drives it into the fabric. (Figure 6.)

Bias Cutting the Fabric Reenforcement

The frictioned fabric is then cut on the bias at an angle of approximately 45 degrees and reassembled end to end in continuous strips, in order to impart maximum flexibility and pressure resistance to the finished hose and to prevent elongation of the hose under pressure. Hose made with bias-cut fabric will expand somewhat under pressure and tend to contract slightly in length. Such a hose is easier to handle in service than one which elongates excessively. In reassembling the bias-cut strips, the ends are overlapped about ½-inch in order to obtain the maximum strength of the fabric at the lap. The tackiness of the compound or "friction" holds the pieces of duck together in the new assembly.

Extruding the Hose Tubes

The machine for this purpose consists fundamentally of a horizontal cast-iron, hollow cylinder with a hopper through which the warm unvulcanized rubber is fed. (Figure 7.) A spiraled helical screw (Figure 8), similar to that in a butcher's meat grinder, runs through the hollow cylinder. When in motion, the power-driven screw forces the rubber around a pin and through a die, and the rubber is thereby extruded from the machine in the form of a tube of about the consistency of firm dough which is usually passed through a water bath for cooling purposes.

The foregoing constitute the primary processes of preparing the principal elements of hose for assembly. We will now describe the fabricating processes of the four commonly used types of hose construction: namely, Wrapped Hose—*Machine* Made—Mandrel Cured; Wrapped Hose—*Hand* Made—Mandrel Cured; Molded Braided Hose—Press Cured; Circular Woven Cotton Jacketed Hose.

Wrapped Hose—Machine Made—Mandrel Cured

Machine-made wrapped hose is used primarily where maximum service life and dependability under the most severe service conditions are essential. The process under which it is manufactured permits of the use of the highest quality compounds and reenforcement materials in the inner tube, fabric carcass, and outer cover. It also produces a very uniform product of maximum strength since each intermediate manufacturing process can be carefully controlled. Hose of this type is made in standard lengths of 50 feet, on smooth steel mandrels, having a diameter corresponding to the desired internal diameter of the finished hose.

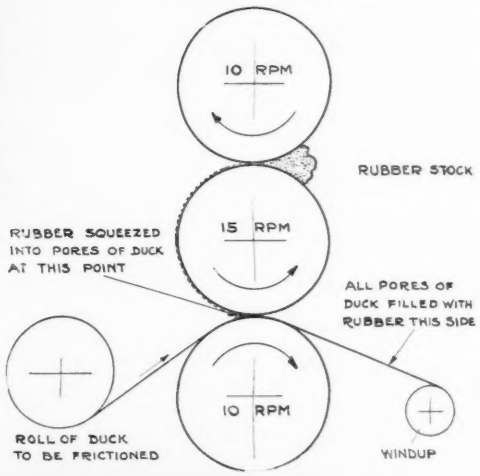

10 RPM
RUBBER STOCK
RUBBER SQUEEZED INTO PORES OF DUCK AT THIS POINT
15 RPM
ALL PORES OF DUCK FILLED WITH RUBBER THIS SIDE
10 RPM
ROLL OF DUCK TO BE FRICTIONED
WINDUP

Fig. 6. Diagram Showing Method of Frictioning Cotton Fabric

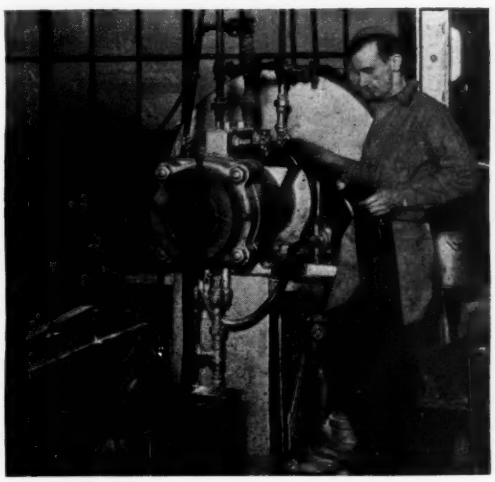


Fig. 7. Running Hose Tubes on Tubing Machine

The following brief descrip-

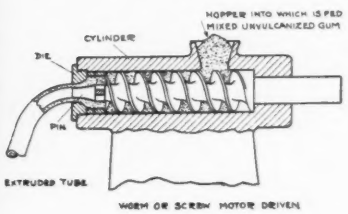


Fig. 8. Showing How Tubes Are Formed inside Tubing Machine

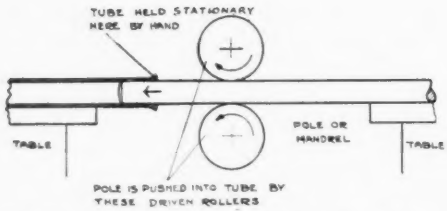

TUBE HELD STATIONARY HERE BY HAND
TABLE
POLE OR MANDREL
TABLE MANDREL OR POLE
POLE IS PUSHED INTO TUBE BY THESE DRIVEN ROLLERS

Fig. 9. Inserting Steel Mandrel in Hose Tube

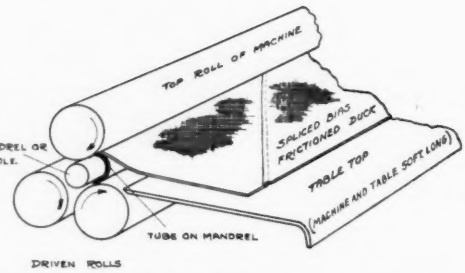


Fig. 10. Forming the Fabric Reenforcement Plies on Hose Making Machine; Note That the Mandrel Is Spun on Its Axis so as to Wrap Itself in the Fabric

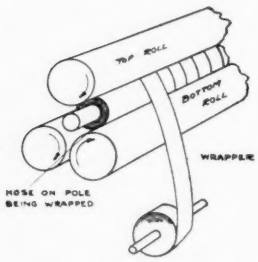


Fig. 12. Temporarily Wrapping Hose in Cloth Wrappers prior to Vulcanization

tion and outline of the various assembly and vulcanizing operations will enable the readers to understand how machine-made wrapped hose is built. We will accordingly trace each successive step by photographs and diagrams.

Building Duck Reenforced Hose

The inner tube, extruded from the tubing machine in 50-foot lengths, is slipped on the steel mandrel (a hollow steel pole 50 feet in length), as shown in Figure 9, which is then placed in the hose making machine illustrated in Figure 10.

The frictioned duck carcass, cut on the bias cutter to the proper width for making the specified number of reenforcing plies, is laid with the edge of the fabric over the tube, also as shown in Figure 10. The mandrel is then rotated in the making machine, which consists of three sets of rollers revolving in such a manner that the frictioned fabric is wrapped around the tube to form the requisite number of plies. A calendered sheet of rubber cover stock, of proper thickness and width, is now applied over the duck. The mandrel is revolved again around its axis in the same machine, and the hose now has a uniform covering of unvulcanized rubber over its entire length. Figure 11 shows these several operations progressively from right to left.

Fig. 11. Machines for Making and Wrapping Mandrel Cured Hose

Fig. 13. Loading Hose Vulcanizer with Wrapped Hose

Wrapping and Vulcanizing Duck Reenforced Hose

Preparatory to the vulcanizing process the fabricated hose, still on the mandrel, is temporarily wrapped consecutively with straight and spiraled cloth wrappers under considerable pressure on a wrapping machine. (Figure 12.) This presses the tube, duck carcass, and rubber cover firmly together and protects the unvulcanized rubber from direct contact with steam. The wrapped hose is then placed on a long carriage in lots of 75 to 100 lengths at a charge and is wheeled into the vulcanizer—a cylindrical boiler approximately four feet in diameter by 55 feet long. (Figure 13.) The door of the vulcanizer is closed, and the hose is vulcanized by admitting steam into the vulcanizer at 35 to 40 pounds' pressure for approximately one hour. The final operation consists of removing the protective cloth wrappers from the hose and stripping the hose from the mandrels by means of compressed air applied at one end, thus expanding the hose and permitting it to be slipped from the mandrel.

Hose, as described in the foregoing, is made in sizes up to 2½ inches internal diameter. The weight of duck reenforcement may run from 8 to 24 ounces per square yard.

Wrapped Hose, Sheeting Reenforcement

"Sheetings" instead of "ducks" are employed for reenforcing small diameter hose used in service where light weight and flexibility are essential. These sheetings have adequate strength for the purpose intended and run in weight from four to six ounces per square yard. The sizes of hose run from 3/16- to ¾-inch internal diameter. The method of manufacture is identical to that where heavier ducks are used.

(Part II, in our next issue, will conclude the discussion of other types of reenforcement for machine-made wrapped hose and will also treat of hand-made wrapped hose, molded braided hose, and circular woven cotton jacketed hose.)

Foreign Trade for Rubber Goods

January imports of foreign rubber goods into the United States amounted to $87,884, a 3% increase over $85,302 in December; compared with the January, 1938, imports, amounting to $123,323, a decrease of 28.7% was registered.

Exports of rubber products from the U. S. during January were valued at $2,172,872, a 4.4% increase over the January, 1938, export figure of $2,082,183. Compared with the December, 1938, exports, value $2,455,446, a decline of 11.5% was shown. *Commerce Reports.*

Recent Developments in Rubber Powder

R. W. Parris[1]

THE manufacture of rubber powder has now reached a stage when it is convenient to review the various methods of preparation with special reference to recent developments. Work on rubber powder was initiated with a view to reducing or eliminating the mastication process and producing a material which could be molded in a similar way to synthetic resin powders of the phenol-formaldehyde type. Some success has been achieved in this direction, particularly in the production of molded hard rubber articles, but other possibilities for the use of rubber powder are now being explored, especially its application for road surface construction.

Preparation

The various methods by which rubber powder has been prepared may be divided conveniently into four classes: namely, (*a*) spraying of latex; (*b*) precipitation of rubber from latex and other dispersions; (*c*) mechanical disintegration of coagulum; and (*d*) mechanical disintegration of sheet or crepe rubber. The methods involving the treatment of latex, particularly the latex spraying methods, appear to be the most promising, both economically and from the point of view of the nature of the product, as under suitable conditions, a very fine powder, passing a 200-mesh sieve, can be prepared by spraying latex.

Spraying of Latex

The fundamental principle of the latex spraying method dates back to the work of Krause[2] and Hopkinson,[3] although these workers concerned themselves with the production of a whole latex rubber and made no attempt to keep the dried latex particles separate. Subsequently several attempts were made to prepare a rubber powder by spraying latex, but the successful development of the method is due to the Dutch chemists, de Schepper and Stam. The de Schepper process[4] consists in spraying latex on to a heated moving endless belt of stainless steel which carries the latex globules through a chamber at a temperature of 90-120° C. The particles of dry rubber thus formed on the belt are prevented from adhering to each other by spraying with zinc stearate, the amount added being about 3-5% on the rubber. The rubber is detached from the belt in the form of a fine crumb by means of a revolving roller.

In the Stam process,[5] latex containing added protective colloids is sprayed into a current of hot air by means of a trumpet-shaped centrifugal sprayer, having, for example, a maximum diameter of about 30 cm. and being rotated at a speed of 15,000 revolutions per minute. The latex flows upward to the spraying head, and hot air is forced upwardly through an annular orifice surrounding the sprayer. As the particles of latex are ejected from the sprayer, they meet the current of hot air, are dried, and carried upward through a hole in the top of the drying chamber. To stabilize the latex and to prevent adhesion of the particles, an ammoniacal solution of zinc ammonium phosphate is added to the latex prior to spraying, and the dried rubber powder is dusted with magnesium carbonate. The final product contains 8% of zinc ammonium phosphate and 2% of magnesium carbonate. By suitably controlling the conditions of manufacture a fine powder, passing a 200-mesh sieve, can be prepared. By adding suitable vulcanizing and other compounding ingredients a compounded rubber powder can be produced which, it is claimed, can be used for direct molding.

Precipitation of Rubber from Latex and Other Dispersions

Several methods are based on the precipitation of rubber from latex and other dispersions. The products usually contain a considerable proportion of added material and are of relatively large particle size, being of a crumb-like nature. In a process developed by Twiss and co-workers of the Dunlop Rubber Co.[6] ingredients are added to the latex in two stages, the second addition causing flocculation of the latex, or water-soluble substances are added which react in the latex to form an insoluble substance which causes flocculation.

A more recent flocculation method, due to Plaizier,[7] has been operated on a moderately large scale. A mixture of 25 parts of 40% latex and 75 parts of a 5% aqueous suspension of colloidal clay is flocculated by the addition of 70 parts of a 25% aqueous suspension of lime. The flocculated material is separated with the aid of a centrifuge, dried in a vacuum drier, and powdered in a distintegrator to give a product having a particle size of less than 1 mm. The composition of the powder is rubber 32%, colloidal clay 12%, and lime 56%.

A reversible powder, that is a powder which can be re-converted into latex by the addition of aqueous ammonia, is made by a method due to Noble.[8] A hydrophilic colloid such as casein dissolved in ammonia and a flocculating agent such as zinc chloride are added to the latex, and the resulting flocculent coagulum is ground to form a product passing a 100-mesh sieve. This type of powder has been used for preparing molding powders, which, it was found, could be molded with equipment identical to that used for molding synthetic resins of the phenol-formaldehyde type.

In a method due to Merrill[9], an artificial dispersion is employed. A compounded rubber containing vulcanizing agents is dispersed in a solvent that can be removed by

[1] The Research Association of British Rubber Manufacturers.
[2] See E. A. Hauser, "Latex," 1927, p. 103.
[3] U. S. patent Nos. 1,423,525-6, 1922.
[4] U. S. patent No. 1,981,691, 1934.
[5] U. S. patent Nos. 2,002,252, 2,009,531, 1935; 2,035,437, 2,041,305, 1936; 2,082,304, 1937; British patent Nos. 388,341, 1932; 420,334, 1933; 438,230, 1934; 438,249, 439,777, 1935; 445,591, 1934; 446,460, 1935.
[6] British patent Nos. 327,451, 338,975, 1929; 346,446, 351,938, 1930; 373,222, 373,262-3, 379,311, 1931; 396,159, 404,665, 405,956, 410,793, 1932.
[7] Netherlands patent appln. 82,193; "First Report of the Rubber-Foundation Covering the Period Oct. 31, 1936, to Dec. 31, 1937."
[8] India Rubber World, 90, 5, 27 (1934); U. S. patent No. 2,019,055, 1935.
[9] British patent No. 468,586, 1935; Canadian patent No. 366,073, 1937.

steam distillation. The dispersion is then emulsified in water, and the solvent removed. The boiling point of the liquid is raised by the addition of a substance such as calcium chloride, and the mixture is heated to effect partial vulcanization of the rubber and to yield a product consisting of particles varying in size from a powder to a coarse crumb.

Mechanical Disintegration of Coagulum

By the use of a suitable type of disintegrator, coagulum prepared by ordinary methods can be converted into a fine crumb.[10] Disintegration is facilitated by the addition of various substances to the latex prior to coagulation, particularly 1% or more of sodium nitrite.[11]

Mechanical Disintegration of Sheet or Crepe Rubber

Untreated sheet or crepe rubber can be distintegrated by mechanical grinding, but the process is accelerated by a preliminary treatment of the rubber or by the addition of suitable substances to the rubber during grinding. In the method of Twiss and co-workers,[12] the rubber is given a preliminary soaking in water or in an aqueous solution of alcohol, glycerin, or formalin; while aqueous ammonia is used in the method of Martin and co-workers.[13] Eaton and co-workers[14] noticed that the addition of lecithin or *Hevea* lipin to raw rubber during mastication on the rolls caused the rubber to form a mass of crumbs; while Minatoya and Kurahashi[15] observed that triethanolamine, esters of hydroxycarboxylic acids, ethylene glycol, glycerin, and other substances had a similar effect on raw rubber. Porritt and Willott[16] prepared a relatively fine crumb by adding an aqueous alkaline solution such as a solution of ammonia, sodium carbonate, sodium hydroxide, sodium silicate, or a soap to rubber on the mill.

Application to Road Building

Problems facing the rubber grower at the present time are over-production and the predominance of the pneumatic tire as the chief outlet for rubber. For the time being restriction of output has provided a solution to overproduction, but a more desirable and more permanent solution would be the development of new uses for rubber or the extension of present uses which would absorb an increased quantity of rubber and give rise to a better balanced and more stable consumption so that restriction would no longer be necessary. It has long been realized that the extended use of rubber for road surfacing would provide an outlet for enormous quantities of rubber, but rubber road blocks and road compositions containing a considerable proportion of rubber are too costly to compete under present conditions with existing road surfacing materials. However the use of tar and asphalt compositions containing a small proportion of rubber of the order of ½ to 1% would appear to be a practical solution to the problem. In the preparation of such compositions the use of rubber powder is especially advantageous, as in the finely divided form dispersion of the rubber in hot tar or bitumen takes place much more rapidly than is the case with sheet or crepe rubber.

Dispersion in Bitumen

To disperse rubber powder in bitumen the latter is heated to 75-100° C. above its softening point (as measured by the ring and ball method), and the rubber powder is stirred in. For maximum improvement in the properties of the bitumen the mixture should be maintained at this temperature for about an hour.[17] An alternative method of incorporating the rubber consists in dissolving the rubber in flux oil and then mixing the solution with bitumen.[18] By the addition of rubber powder to bitumen, the softening point, the viscosity, the resistance to penetration, and the resistance to impact of the bitumen are increased, while the plastic flow is decreased.[19] These modifications in the properties of the bitumen are advantageous from the point of view of its use in road surfacing. Laboratory tests on such bitumen-rubber powder compositions have been made by Davey,[20] Fol and Plaizier,[19] and van Rooijen.[17] A typical set of results obtained by van Rooijen is given in the table below and illustrates the effect of the rubber powder on the properties of the bitumen.

	A*	B†
Resistance to impact at 15° C. (weight in grams of a ball which, when allowed to fall from a height of 2 m. on to a sample of the material, 5 mm. thick, supported on an iron plaque, fractures the sample)	36	112
Elasticity in % (Hoekstra balance plastometer)	6	10.5
Flow in mm. at 40° C.	about 170	17
Penetration at 25° C. (Hutchinson penetrometer)	55	37
Softening point (ring and ball method)	52° C.	65° C.
Viscosity at 100° C. (modified Redwood viscometer)	17 sec.	120 sec.

* A: asphaltic bitumen.
† B: asphaltic bitumen containing 5% of rubber powder prepared by the Stam process.

Van Rooijen has made an interesting conjecture as to the mechanism underlaying the dispersion of rubber powder in bitumen. He suggests that when rubber powder is added to asphaltic bitumen, the particles of rubber absorb the lighter hydrocarbons present in the bitumen. A disperse system is thus formed consisting of swollen grains of rubber dispersed in an asphaltic bitumen which is of the same type as the original bitumen, but harder. This hypothesis explains the changes effected in the properties of bitumen by the addition of rubber, as described above, except for the increase in impact strength.

Laboratory and Service Tests

Laboratory wearing tests conducted in Netherland India have shown that the addition of rubber powder increases the wear resistance of asphalt.[21] Extensive road trials are now in progress in the Netherlands to confirm the results of the laboratory tests.[22] Twelve trial areas have been laid. The quantity of rubber powder added to the road composition represented about 5% on the bitumen or road oil or about ½% on the entire aggregate. Rubber powders made by the methods of de Schepper, Stam, and Plaizier were employed. In seven of the trial areas, varying in size from about 200 to 7,000 square meters, surface dressings were employed consisting of a solution of rubber in road oil to which sand, grit, or other filler had been added. A typical composition consisted of rubber powder (prepared by the de Schepper process) 0.65-part, road oil 12.35 parts, sand 86 parts, and Enci filler 14 parts.

In the remaining six trial areas, varying in size from about 250 to 1,800 square meters, fine asphaltic concrete compositions incorporating rubber powder were used to form the whole of the road surface. A typical composition consisted of rubber powder (prepared by the Stam process) 0.5-part, asphaltic bitumen 10.2 parts, sand 65.6

(*Continued on page* 48)

[10] H. R. Braak, *Chem. Weekblad*, 33, 617 (1936).
[11] G. Martin, Rubber Growers' Association, Inc., British patent Nos. 395,775, 396,880, 1932.
[12] British patent No. 391,309, 1932.
[13] British patent No. 410,875, 1932.
[14] *J. Rubber Research Inst. Malaya*, 2, 136 (1930).
[15] *J. Soc. Chem. Ind. Japan*, 37, 207B (1934); 9, 53 (1936).
[16] British patent No. 475,503, 1936.
[17] J. M. van Rooijen, Communications of the Rubber-Foundation, No. 7, 1938.
[18] Netherland patent No. 36,887.
[19] J. G. Fol and J. A. Plaizier, Communications of the Rubber-Foundation, No. 3, 1937.
[20] W. S. Davey, *J. Soc. Chem. Ind.*, 55, 43T (1936).
[21] T. G. E. Hoedt, G. J. van der Bie, C. Ortt, and R. E. Kerkhoven, Eighth International Road Congress, 1938.
[22] The Rubber-Foundation, "Rubber in Roads," 1938.

The Bi-pressure Tire[1]

R. de Poucques

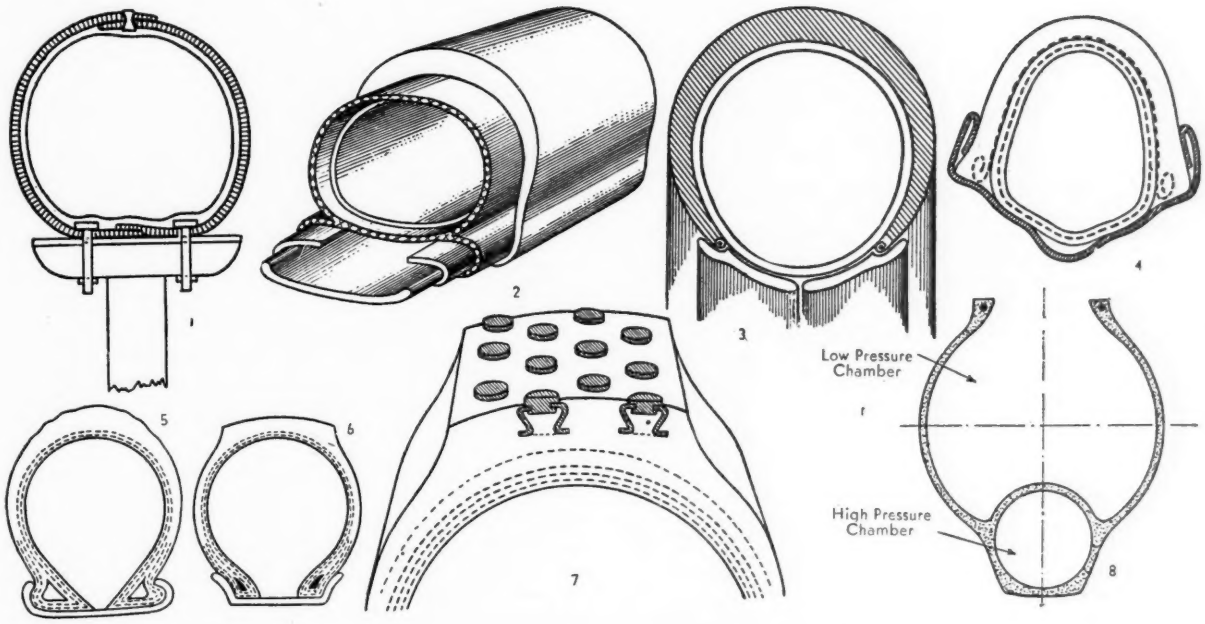


Fig. 1. Pneumatic Tire Made under Thomson Patent (1845); Fig. 2. First Dunlop Pneumatic (1888); Fig. 3. First Demountable Pneumatic Made by Welch (1890); Fig. 4. First Bartlett Clincher Tire (1890); Fig. 5. Clincher Tire of 1898; Fig. 6. Straight Side Tire (Early Twentieth Century); Fig. 7. Palmer Non-Skid (1893); Fig. 8. Section of a Bi-pressure Tire

DESPITE the tremendous development of the pneumatic tire the problem of perfecting it is still present. In this connection it is interesting to review the history of the pneumatic tire in order to classify the main results obtained up to now so as to get a better view of the fields in which progress has been least fruitful and could therefore be pursued.

Review of Early History

The pneumatic tire made its appearance in 1845 in the form of a torus (Figure 1), the first patent being registered by Robert William Thomson, in England. *The Mechanics Magazine* of London at the time announced a performance of 1,200 miles for such tires mounted on the wheels of horse-drawn vehicles.

Much later, in 1888, John Boyd Dunlop took out a patent for a cycle tire (Figure 2) and founded a factory for this type of elastic tube.

In 1890, Charles Kingston Welch obtained a valuable English patent for removable means of mounting the tire onto a special wheel rim (Figure 3). In that year also William Erskine Bartlett registered a patent for a removable clincher tire (Figure 4). More improvements followed, especially when the automobile appeared about 1898 (Figure 5).

At present the clincher tire has been discarded in favor of the more practical and firmer fitting straight side tire (Figure 6).

In 1893 John Fillerton Palmer obtained an English patent for the manufacture of a cord tire, but this idea, by which square woven fabric was to be replaced by separate cords insulated in a film of rubber, was difficult to carry out in practice, and it was not until very much later, when warps of rubberized cords were employed, that the process was simplified and popularized. These warps were first used around 1912 by Palmer in London and Torrilhon in France. The large sizes of good quality pneumatic tires had not exceeded 135 millimeters in diameter in the case of the torus; pressure was 10 kilograms per square centimeter for a load of 1,000 kilograms per wheel; and sizes of pneumatics varied from 750 by 65 to 935 by 135 millimeters. But where the tire made with square-woven cloth tore, cord tires permitted the successful use of larger cross-sections.

Finally in 1923 the low-pressure (2.5 kilograms) balloon or comfort tire was developed. The flexible or super-balloon with 1.5 kilograms' pressure appeared in 1932. At present some heavy-duty pneumatic tires such as the 44 by 12 have a section with a diameter of 300 millimeters. The external diameter of the wheel has been lowered in recent years (to lower the passenger car).

As to wear, in 1911 Newton, who during a race at Brookland, kept track of the loss of material in his tires, found that after two hours of riding at 139 kilometers

[1] Translated from *Rev. gén. Caoutchouc*, May, 1938, pp. 122-26.

an hour, each front tire had lost 0.4-kilogram and each rear tire 0.9-kilogram. In 1912 car tires did 3,000 kilometers; while Michelin, who used the first twin tires, could claim 8,000 kilometers for trucks. In 1919 the principal firms guaranteed tires for 5,000 miles. Then in 1922 guarantees were increased to 8,000 miles and at present the high perfection of manufacture in all its stages permits performances of 60,000 kilometers, and for certain heavy-duty tires mileages of over 100,000 kilometers are obtained.

In the course of this evolution the question of improving the non-skid properties of the treads was not neglected; 30 years ago the cover was generally studded with metal rivets with projecting heads. (Figure 7.) These were succeeded by all-rubber anti-skid devices with all kinds of protuberances on the tread; recently lamellated tires have appeared.

Classification of Improvements

This review of the history of the tire permits a classification of the various improvements under the following heads: safety, durability, comfort, and rolling efficiency.

With regard to the factor safety, we see that the pneumatic tire was equipped with an airtight chamber, then with tightly fitting clincher covers, then with straight side tires that would not blow off the rim, and finally with different anti-skidding devices. To increase the life of the tire we have the changes in the profile of the tread, the substitution of warps of cords for the square-woven canvas cloth, constant improvements in the materials employed. On the other hand we find that outside of the low-pressure balloon tire nothing has been developed to increase comfort. As to rolling efficiency, here we see little improvement, but rather negative influences due to the adoption of low pressure and the reduction of the external diameter of the wheel. Up to the present, therefore, comfort and rolling efficiency have been rather neglected in the course of the evolution of the tire.

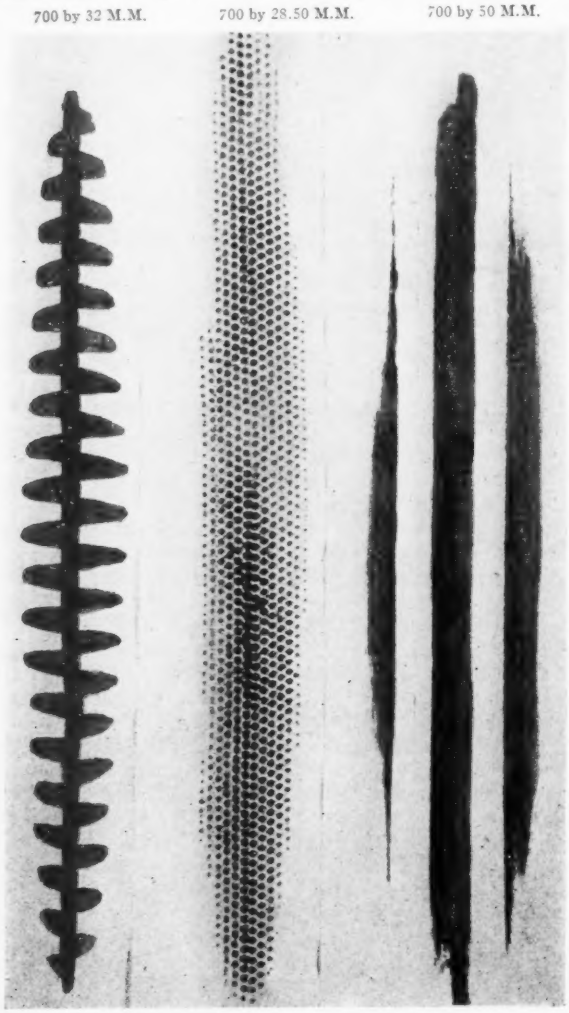


Fig. 9. Road Impressions of Three Types of Tires at Normal Pressure and under Equal Loads

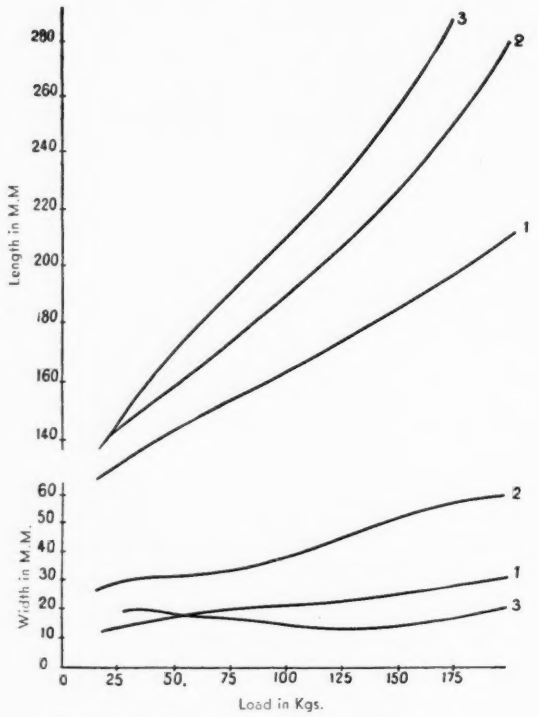


Fig. 10. Variations of Dimensions of Impressions

On the other hand we find that among the advances made in automobile manufacture these factors have not been neglected. On the contrary real effort has been applied in these directions of late in spite of better roads. Indeed we have seen that to increase comfort, automobiles have been fitted with shock absorbers for the springs, independent wheels and suspended motors; while the cars have been streamlined and the chassis lowered for better speed.

It would be rash to claim that the pneumatic tire has reached the height of possible efficiency. Nevertheless we know that it is difficult to do more with it in its present stage of development where any change of the section to increase comfort regularly causes a loss in the running efficiency and *vice versa*. However improvement is possible by adopting new tire forms other than the torus shape in use since 1845, whose possibilities of further improvement have been exhausted; hence the bi-pressure tire (Figure 8) is recommended.

It would be particularly desirable to see an improvement in the bicycle, a means of locomotion which preceded the automobile but, which in the main has undergone little change and has, for instance, not been provided with springs or shock absorbers. We now consider this

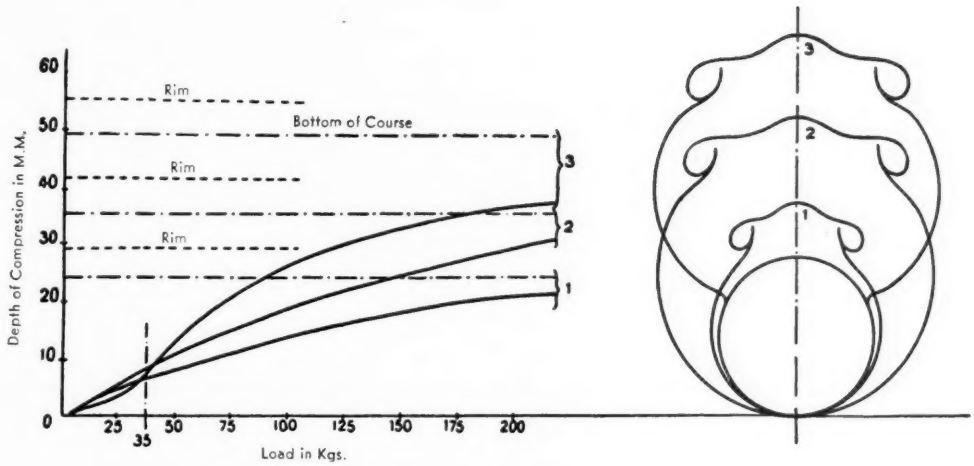


Fig. 11. Changes in the Graph of the Compression Stress for Three Types of Tires

new type of tire for the cycle which will help increase speed and reduce fatigue.

The cross-section of this tire (Figure 8) shows two chambers: the lower, small one is inflated to high pressure, and the large upper one, to low pressure. In this combination are united the best rolling qualities of the racing tire and the comfort of a balloon tire. We shall show the positive and conclusive results as obtained from various measurements, tests, and calculations. The comparison is made among three types of tire at normal inflation: a racing tire, 700 by 32, inflated to a pressure of 2.5 kilograms; a balloon tire 700 by 50, inflated at 1.25 kilograms; and the bi-pressure tire 700 by 28.50 at pressures of 2.5 kilograms and 0.5 kilogram.

Rolling Efficiency

When the three types of tires were subjected to increasing loads, their successive compressions gave variations in the contacting surface as measured by the impressions produced on the ground (Figure 9). The lengths and the breadths of these impressions expressed in a graph (Figure 10)[2] give variation curves, from which it can be seen that the bi-pressure tire shows excellent values in the breadth of its contacting surface, even better in fact than that of the racing tire. As a result, the lengths of the contacting surface are naturally extended, but as was pointed out in an earlier article,[3] the width of the contact surface is important, for when it is reduced, the running efficiency of the tire is increased, while the lamination of the air, the suction effect, permanent sliding stress and sliding stress due to irregularities in the road, are reduced. From this point of view, then, the bi-pressure tire is advantageous.

Compression Stress

The three tires inflated to their normal pressure were subjected to increasing loads, and the corresponding amounts of compression are represented graphically in Figure 11. A curve is thus found for each tire which limits between it and the axis of the ordinates the surface representing the compression stress. Now with regard to the graphic representation of the compression stress, we know that the more acute the angle formed by the curve and the axis of the ordinates, the more comfortable the tire will be.[3] In the present case, therefore, it will be seen that according to the graph the bi-pressure tire is considerably more comfortable than the racing tire and even more than the balloon tire. It will be noted, in connection with the first phase, corresponding to the permanent compression due to a normal load of 35 kilograms per wheel, that the compression stress can be maintained at a value equivalent to the racing tire by means of a suitable shaped tread. But in the second zone, every shock resulting from an obstacle or a fall, is absorbed over a longer course in the case of the bi-pressure tire, as the graph indicates. This tire, therefore, is more flexible and elastic than the others.

In the same graph (Figure 11) it is easy to note the maximum course of compression of the three tires, without omitting the thickness of the tires under the rim. There again the bi-pressure tire shows a considerably longer course, and as we shall see in the drop tests, such a tire will pass over big obstacles, as rails at a level crossing, without hitting the rim.

Rebound Tests and Coefficient of Elasticity

The graph (Figure 12) shows the variation in the rebounding height of the three types of tires normally inflated and tared at 3 kilograms. The differences will be noted in the drop of the tires required for compression to the bottom of the rim. If a fall of 1.5 meters suffices

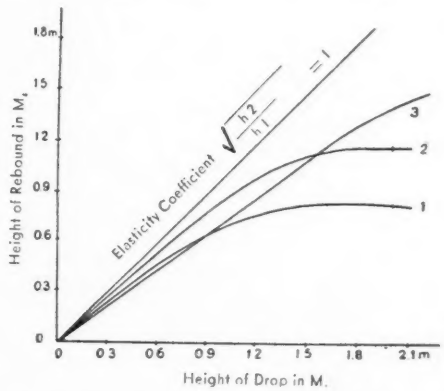


Fig. 12. Rebound Test and Elasticity Coefficient

[2] In Figures 10, 11, and 12: 1 represents the racing tire (high pressure); 2, the balloon tire (low pressure); and 3, the bi-pressure tire.
[3] "Can the Pneumatic Tire Be Improved?" *Rev. gén. Caoutchouc*, Jan., 1937, pp. 3-11.

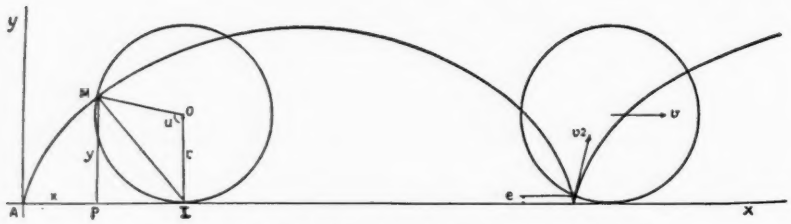


Fig. 13. Cycloid Described by a Point on the Tread

for the racing tire, the bi-pressure will require a height of 2.5 meters, that is to say, even more than for the balloon tire.

Another indication that should be noted is the coefficient of elasticity of the tires as shown by the curves of the rebound height. The fictitious straight line placed at 45 degrees represents the maximum coefficient of elasticity

$$\sqrt{\frac{h_2}{h_1}} \text{ equals 1.}$$

As to the curve of the bi-pressure tire, it shows a lower coefficient of elasticity in its first zone—corresponding to normal shocks—than the other types, indicating that the bi-pressure tire rebounds least. For greater shocks it retains a coefficient of elasticity which, though considerable, is no longer comparable with the other tires, which hit the bottom of the rim under the same circumstances. The conclusion again follows that the bi-pressure tire is the least rebounding of the tires.

Rebound of a Point of the Revolving Tread on an Obstacle

When the tire rolls, each point of the tread describes a cycloid. This, however, is truncated by the permanent effect of compression due to the load (Figure 13). Let us assume the three types of tires inflated to normal pressure and suppose an obstacle which produces a fixed compression for one of them, say the racing tire. By allowing the three different types of tires to pass over this obstacle, we will find the relation of the speeds of rebound to the kinematic speeds of a given point at the compressed part of the tread.

Let there be a cycloid (Figure 13) expressible as:

$$x = r\ (u - \sin u)$$
$$y = r\ (1 - \cos u)$$

where r is the radius of the tire, r=700/2=0.35 meter, and u is the parameter. The obstacle considered has a height equal to e = 19 millimeters.

The kinematic speed (v_2) of the point of contact on leaving the obstacle is expressed as:

$$v_2 = \frac{MI \times v}{r}$$

where v is the translation (shifting) speed of the wheel.

Now $(MI)^2 = y^2 + (r \sin u)^2 = [r\ (1 - \cos u)]^2 + (r \sin u)^2 = 2r^2\ (1 - \cos u)$ and $MI = r\sqrt{2\ (1 - \cos u)}$.

Furthermore $(1 - \cos u) = \frac{e}{r}$

hence:

$$MI = r\sqrt{\frac{2e}{r}} \quad \text{and} \quad v_2 = \sqrt{\frac{2e}{r}} \times v$$

At a speed of 25 kilometers per hour, for instance, the shifting speed is v=7 meters a second approximately, and we obtain for the kinematic speed of the point of contact leaving the obstacle:

$$v_2 = \sqrt{\frac{2 \times 0.019}{0.35}} \times 7 = 2.3 \text{ meters a second}$$

This result is valid for the three tires considered.

The rebounding speeds of these tires will be found from (Figure 12). Under the conditions of the test the racing tire required a dropping height of 0.75 meter to flatten on an obstacle 19 millimeters high. Taking the corresponding rebound height, as basis, that is 0.59-meter, the rebounding speed of the point leaving the road will be found thus:

$$v_3 = \sqrt{2\,g\,h} = \sqrt{2 \times 9.81 \times 0.59} = 3.42 \text{ m. per second}$$

and the ratio of the speeds is established as:

$$\frac{v_3}{v_2} = \frac{3.42}{2.30} = 1.5 \text{ approximately.}$$

For the balloon tire, the compression on the obstacle of 19 millimeters gives compression stress of 107/160 as compared with that of the racing tire, as can be found from Figure 11. The dropping height for the ballon tire can be worked out as follows:

$$0.75 \times \frac{107}{160} = 0.5 \text{ m.}$$

A rebounding height of 0.44-meter (Figure 12) corresponds to this fall. The rebounding speed when the tire leaves the ground will then be:

$$v_3 = \sqrt{2\,g\,h} = \sqrt{2 \times 9.81 \times 0.44} = 2.94 \text{ m. per second}$$

and the ratio of the speeds works out as:

$$\frac{v^3}{v^2} = \frac{2.95}{2.30} = 1.27$$

Finally for the bi-pressure tire, the compression on an obstacle of 19 millimeters gives compression stress of 67/100 as compared with that of the racing tire, as can be determined from Figure 11. The dropping height causing this stress will therefore be:

$$0.75 \times \frac{67}{160} = 0.315 \text{ m.}$$

A rebounding height of 0.22-meter (obtained from Figure 12) corresponds to this drop. The rebounding speed will thus be:

$$v_3 = \sqrt{2\,g\,h} = \sqrt{2 \times 9.81 \times 0.22} = 2.08 \text{ m. per second,}$$

and the ratio of speeds is

(*Continued on page* 48)

New Applications of Glycerine in Rubber

Georgia Leffingwell[1] and Milton A. Lesser[1]

RECENT literature and patent registrations demonstrate the fact that glycerine has maintained its important place in connection with rubber treatment and compounding. As formerly,[2,3] not only has glycerine found many new uses, but many older applications have been readapted to meet newer needs. The widespread use of glycerine in rubber arises from its unique combination of desirable physical and chemical properties. Of importance is the fact that glycerine is a clear, viscous, syrupy liquid, which is heavier than water, but more vital is the point that though entirely soluble in water and alcohol, glycerine is not miscible with rubber-deteriorating agents such as gasoline, benzine, ether, carbon disulphide, and oils. The hygroscopic nature of glycerine, as well as this fluid's high boiling point and low freezing point, is also a considerable factor in rubber compounding where it is necessary to maintain softness and flexibility and to prevent drying and brittleness.

Vulcanizing Medium

At the Rubber Technology Conference held in London during May, 1938, Thiollet[4] presented a new method, employing glycerine as a major element for ultra-rapid vulcanization at high temperatures. He described the equipment and the technique by means of which it is possible to vulcanize rubber mixtures in glycerine under high pressure at high temperatures under accurately controlled conditions. A base mixture, in sheets of various thicknesses, was vulcanized at 195° C., and the tensile properties of the vulcanites were determined before and after aging in an oxygen bomb. After a series of tests using various accelerators in various proportions, Thiollet selected four combinations as those giving the best results in the glycerine-containing apparatus. It was found that all of these mixtures vulcanized very rapidly and uniformly, showed no tendency toward premature vulcanization, had good physical properties over a long plateau of vulcanization, and aged well.

A chart shows the time of optimum state of cure as a function of thickness. This was practically a straight-line function. Thus, sheets one, three, and five millimeters thick required approximately ten, forty, and ninety seconds. Vulcanization was uniform throughout the thicker sheets. Thiollet's experimental work with vulcanization in glycerine is particularly important in connection with the manufacture of electric cables and other continuous process products.

Lubricant

Glycerine is an effective lubricant in molds to prevent adhesion of rubber to the molds during vulcanization. A recent Italian process for preventing the adhesion of unvulcanized rubber surfaces lists glycerine prominently for this purpose. In the manufacture of pneumatic tires which have treads with fine cuts that were formed in the tread prior to the vulcanization, a medium for the prevention of adhesion of the walls is introduced into these cuts either during their formation or after they have been made. Glycerine in water or alcohol may be used for this purpose, according to this patent.[5]

Glycerine is a safe lubricant for all types of rubber and vulcanized rubber articles. It does not react with the rubber to produce deleterious changes, but rather serves as a preservative and softener. Quite recently mineral oil and glycerine were tested comparatively as lubricants for rubber catheters. Red rubber catheters were lubricated with mineral oil and with glycerine; after five minutes they were washed with a soap solution, rinsed with clear water, and boiled for five minutes, after which the tubes were tested for flaccidity and resiliency, and the process was repeated. At the end of 37 boiling periods, the tube lubricated with mineral oil was flaccid, non-resilient, herniated, and unfit for use. At the end of two hundred boiling periods the tube lubricated with glycerine was quite firm and only somewhat lighter in color, not differing from a control tube subjected to the same test for the same number of boiling periods, but without lubrication. The conclusions reached, from these data, is that glycerine is a much more economical lubricating agent for rubber than mineral oil, even though glycerine may have a slightly higher initial cost.[6] Glycerine lends itself to rubber lubricating preparations, particularly those of vegetable origin, such as jellies and pastes.

The preservative and softening effects of glycerine on rubber articles have found widespread use. According to a French patent,[7] the suppleness and the elasticity of rubber articles are preserved by rubbing the surface of the rubber with a mixture of glycerine and lemon juice or by steeping the articles in the mixture. An example of the mixture contains: glycerine 80, almond oil 4, lavender oil 4, sugar 4, petrolatum 3, lemon peel 2, and lemon juice 3.

Rubber is sometimes glycerine-treated to impart special qualities or properties. Thus a chlorinated rubber product which is of a gummy or resinous character is obtained by the reaction of glycerine with a chlorine-containing rubber derivative such as rubber hydrochloride. A suitable temperature for heating the reacting mixture is 140° C.[8] When it is desired to include sodium stearate in a rubber mixture, the stearate should be added as a dilute solution in glycerine, according to one process.[9]

Coating Compositions and Adhesives

Glycerine-rubber coatings are finding much use on

[1] With Glycerine Producers' Association, 11 W. 42nd St., New York, N. Y.
[2] G. Leffingwell and M. A. Lesser, *Rubber Age*, (New York), 42, 237 (1938).
[3] G. Leffingwell, *Ibid.*, 39, 338, (1936).
[4] R. Thiollet, Rubber Technology Conference, London, Reprint No. 97.
[5] Soc. Ital. Pirella, British patent No. 478,102, Jan. 12, 1938.
[6] V. Aquadro and G. Barbour, *Am. J. Nursing*, 38, 424 (1938).
[7] K. Stengel and T. Kanders, French patent No. 816,466, Aug. 9, 1937.
[8] H. A. Winkelmann, U. S. patent No. 2,094,933, Oct. 5, 1937.
[9] A. P. Pisarenko and I. Y. Mishustina, Russian patent No. 44,020, Aug. 31, 1935.

paper, cloth, and the like to render them gas-proof, waterproof and grease-proof. When rubber is incorporated in the finish of special papers, glycerine is often beneficial.

To cite one example, paper is coated with an adhesive, containing an aqueous rubber dispersion and glycerine, in addition to other materials. This glycerine-containing coating may be vulcanized after application, or vulcanized latex may be used.[10] In another instance paper particularly suited for wrapping foods contains among other ingredients dispersed rubber latex. This is plasticized with glycerine, here chosen for its hygroscopic nature. When finished, paper treated with the combination is flexible and non-tacky.[11] As an adhesive for specialty papers, glycerine is frequently used in combination with rubber. A rubber composition that employs glycerine as a hygroscopic flexibilizer is used to bond paper and thin sheets of metal.[12] In connection with packagings, the following formula should be of interest. An adhesive for attaching labels to oiled or inked surfaces or the like consists of: a 60% aqueous dispersion of rubber 40-75, used with glycerine 15-40, casein 3-8, and added water about 20%.[13]

Glycerine-Containing Resins

Glycerine-containing resins, variously known as alkyd, glyptal, or glyceryl-phthalate resins, are finding many uses in rubber compounding and treatment. These resins, the reaction products of glycerine and phthalic anhydride or acid, may be adjusted for almost any need by the addition of modifying agents or ingredients. These resins are especially notable for their durability and resistance to weathering.[14] Blake[14] indicates that the search for agents that will reduce the tendency of accelerators to scorch the rubber is a most vital one. Glyceryl-phthalate resins are listed by him as efficient anti-scorching agents. Glycerine-phthalate resins serve also in a wide variety of useful coatings for the protection of rubber articles or for use with protective rubber coatings.[3] A recent process for coating sheet materials such as paper and the like yields products that are water- and grease-proof. There is applied to the material a solution of rubber containing a glycerine-phthalic anhydride condensation product adapted to cause the rubber to wet the sheet material. After this, then is applied a solution of a cellulose ester, including a softener, to cover the first coating.[16]

Other glycerine derivatives might be cited for their use in rubber, Thus the reaction products of glycerine with naphthylamine have been recommended for use as rubber antioxidants.[17]

Preparation of Rubber Substitutes

Glycerine plays a prominent role in the creation of rubber substitutes. One such preparation which has received considerable comment was patented by Kittridge.[18] This substitute is made by heating a mixture of glycerine and polymerized tung oil to about 410 to 450° F. until complete reaction takes place. No milling is required. Other vegetable oils such as soy bean, oiticica, perilla, linseed, and cotton seed oil may be used instead of the tung oil. This rubber substitute is elastic and can be substituted for rubber in paints, varnishes, and in coatings for textile materials. The product can be mixed with natural rubber and is not attacked by oils, greases, many acids, or alkalis. The glycerine-vegetable oil preparation can be vulcanized like rubber with sulphur, but unlike the natural item, the vulcanized product is without free sulphur.

Another recent patent describes a tough, rubber-like phenolic resin which is produced by heating castor oil until it gels and then treating with glycerine. The castor-oil-glycerine reaction product is then treated with an unmodified, oil-soluble resinous condensation product of a phenol and an aldehyde. The final product is soluble in "mineral spirits" and, when applied to a surface, produces a tough, water-resistant, and flexible film.[19] Other examples of glycerine-containing rubber substitutes could readily be given, but the above should suffice to illustrate the trend and to point out the value of glycerine in these products.

[10]International Latex Processes, Ltd., British patent No. 425,941, Mar. 25, 1935.
[11]J. E. Schopp, U. S. patent No. 2,021,947, Nov. 26, 1935.
[12]C. Craemer, French patent No. 788,987, Oct. 21, 1935.
[13]A. D. Fuller, U. S. patent No. 2,073,927, Mar. 16, 1937.
[14]C. Ellis, "Chemistry of the Synthetic Resins," Vol. II., 2d Ed., Reinhold Publishing Co., New York, 1935.
[15]National Research Council, "Annual Survey of American Chemistry," Vol. VI., Section on "Rubber," J. T. Blake, Chemical Catalog Co., New York, 1931.
[16]J. L. Elliott, U. S. patent No. 2,116,065, May 3, 1938.
[17]J. R. Ingram, Canadian patent No. 323,754, June 28, 1932.
[18]H. G. Kittredge, U. S. patent No. 2,111,427, Mar. 15, 1938; French patent No. 810,225, Mar. 18, 1937.
[19]P. E. Marling, U. S. patent No. 2,115,557, Apr. 26, 1938.

Bi-Pressure Tire

(*Continued from page* 46)

$$\frac{v_3}{v_2} = \frac{2.08}{2.30} = 0.9 \text{ m.}$$

When these ratios are compared, that is 1.5, 1.27, and 0.9, it is seen that the bi-pressure tire gives by far the lowest result. This single instance (which can be multiplied) permits the conclusion that the bi-pressure tire is anti-rebounding as compared with the other types of tires.

These results, we believe, are sufficently positive to interest the tire industry in the manufacture of the bi-pressure tire, and this prospect of new advances will be appreciated as it ought to be in this era of rapid evolution of the automobile and the bicycle.

Rubber Powder

(*Continued from page* 42)

parts, granite chippings 14.3 parts, and Enci filler 9.7 parts. So far the experimental areas appear to have given satisfactory service, but a further period of trial is necessary before definite conclusions can be drawn as to the value of using rubber powder in road compositions of this nature.

Future Development

It must be emphasized that rubber powder is a comparatively new product and its manufacture is scarcely beyond the experimental stage. Nearly all the powder produced has been made in Europe or the United States from preserved latex, and difficulties have been experienced in applying the European methods of manufacture to fresh latex on the plantation. Research on rubber powder is still being actively pursued, however, particularly in the laboratories of the Rubber-Stitching in the Netherlands, and there are indications that in due course, rubber powder will find a place among the raw materials used by the rubber industry.

The author wishes to thank the board of management of the Research Association of British Rubber Manufacturers for permission to publish this paper.

Report of A. S. T. M. Committee D-11

THE meetings of 31 committees during A.S.T.M. committee week in Columbus, O., from March 6 to 10 included committee D-11, of interest to the Rubber Industry. There were approximately 150 meetings with registered attendance for the week of about 600, which is considered excellent.

Since 1939 is the year when the American Society for Testing Materials issues its triennially published Book of Standards, all of its committees have concentrated on bringing various specifications and tests up to date, adopting revisions which have been published previously, taking action to adopt as standard existing tentative specifications, and at the same time recommending new specifications covering many materials not now included.

A decision was made by Committee D-11 to organize a new Technical Committee on Automotive Rubber for which the work is to include development of standards for rubber used in motor mountings and similar automotive applications; and possibly other rubber products such as V-belts and hose. In this work the committee will have the cooperation of the Society of Automotive Engineers.

Committee D-11 has completed a survey of the classes of packings and of specifications for these materials in current use, including rubber sheet packings and asbestos sheet packing. This information is for use in the standardization of test methods.

The subcommittee on tape considered revision of cold adhesion requirements to establish separation limits of 8 ± 4 inches per minute instead of 15 inches per minute so as to make A.S.T.M. tape acceptable for railway signal work as well as general electrical purposes.

The tentative methods of sample preparation for physical testing of rubber products (D 15) were approved for adoption as standard. The tentative method of tension testing of vulcanized rubber (D 412) is to be revised and continued as tentative. One change will make the ACS and Federal Specification Board micrometer used for thickness measurements the A.S.T.M. standard in place of the present one. The new micrometer will employ three-ounce dead weight load on a ¼-inch foot in place of the present nine-ounce load. Other changes will take into account the grain effect in rubber specimens and will permit the use of compensating head testing machines for all tension machines.

The subcommittee on physical testing of rubber products will circulate a questionnaire covering details of tension tests with a view to improved standard practice.

Two cooperative laboratory checks for determining small amounts of copper and manganese in rubber have been completed. Discrepancies between laboratories using the same methods have been found to be very considerable in the case of both manganese and copper. A special section will consider a general revision of the methods of chemical analysis of rubber.

Committee D-11 approved the addition of footnote in the test for abrasion resistance (D 394) calling attention to the availability of A.S.T.M. standard specimens for abrasion tests from V. L. Smithers Laboratories.

The subcommittee on life tests has approved the present A.S.T.M. air pressure heat test as published, with reference to reasonable reproducibility in various laboratories. A section of this subcommittee was authorized to develop an aging test using artificial light.

The group of rubber products for absorbing vibration appointed a section to investigate further the method for determining compression set and presented a tentative alternate method for hardness, using a Pusey and Jones plastometer.

The subcommittee on dynamic fatigue testing decided to incorporate, in a new tentative procedure, test methods for compression flexing using the Goodrich flexometer, the Firestone compressatometer, and the St. Joseph Lead Co. flexing machine. This type of test is important in evaluating rubber for heat resistance in flexing and resistance to deterioration caused by compression hysteresis.

A study of viscosity determination by several methods has been completed by the subcommittee on tests of liquid rubber products, and it expects to recommend shortly a tentative method for determining viscosity of cements.

The subcommittee on sponge rubber has completed a questionnaire with which to survey methods in current use for determining the physical properties of sponge rubber. The existing chemical methods of the A.S.T.M. are considered satisfactory.

The subcommittee on hard rubber has completed proposed methods for physical tests, chemical analyses, and electrical tests of this material and will recommend these to the society for publication as tentative.

The tentative methods of test for adhesion of vulcanized rubber (friction test) (D 413) and adhesion to metal (D 429) are being recommended for adoption as standard. These were first issued in 1935 and revised in 1936.

In the three specifications D 27, D 353, and D 469 covering various types of insulated wire and cable, the voltage limits for shielding will be lowered in accordance with industrial practice. Wall thickness on No. 8 A.w.g. wire is to be changed from 4/64-inch to 3/64-inch, but this is provisional on similar simultaneous action in Underwriters Laboratory Specifications and the National Code. Also in D 27 (Class AO, 30%, Hevea Rubber Compound) changes will be made in requirements for saturants and finishes to incorporate the Underwriters Laboratories specifications for interior finishes

The committee accepted a specification for insulating compound for a tough rubber jacket for electric cords and cables to be issued as tentative this year with the understanding that additional requirements may be developed later and agreed to by the test section for inclusion in the specifications.

ON FEBRUARY 1, THIS YEAR, CLASS I RAILROADS HAD 6,637 new freight cars on order compared with 6,563 on the same date in 1938, the Association of American Railroads reports. On January 1, this year, there were 5,080 new freight cars on order.

Rubber Vulcanizing Properties of Colloidal Carbons[1]

W. B. Wiegand and J. W. Snyder[2]

IN THIS paper presented at the Rubber Technology Conference, London, England, May 23-24, 1938, the theoretical considerations and conclusions are of particular value in connection with compounding research and the practical application of colloidal carbons. This paper, which was the result of research conducted on 18 types of carbon in connection with 11 compounds, as originally presented covered three sections: I. Course of Vulcanization; II. Control; and III. Theoretical Considerations.

This abstract reproduces the third section and also conclusions as they are believed to be of interest to all rubber compounders.

Significance of *p*H Properties

The *p*H properties of colloidal carbon have recently been the subject of a communication.[3] The following constitutes a summary of those features believed most relevant to vulcanizing behavior. The inherent surface of carbon is believed to be selectively adsorptive toward hydrogen ions. In proportion as combined oxygen, in the form of what has been termed the C_xO_y complex, becomes attached to the surface, this tendency is reversed. In both cases the ability to affect the glass electrode of the *p*H electrometer and the vehicles in which carbons are customarily used depends on the development of sufficient surface or fineness of subdivision. If the carbon particles are smaller than about 0.2-micron in diameter, these conditions are fulfilled, and *p*H values are recorded ranging from 11 to 3 in a continuous series.

In the presence of water the basic carbon particles are surrounded by an outer layer or atmosphere of hydroxyl ions and in the case of acid carbons by an atmosphere of hydrogen ions. In both cases these ions are sufficiently active to influence the glass electrode, but in neither case is there any development of free extractable acid or base. However, in the presence of neutral salt solutions, both basic and acid *p*H carbons are able, by hydrolytic adsorption, to release the corresponding base or acid, in free form.

In a pigmented rubber system adsorptive forces become operative, and these are controlled as to direction and intensity by *p*H properties, and as to amount by the additional factor of particle size or specific surface. Two independent variables are therefore present and require analysis in order that the vulcanizing behavior of colloidal carbon, in any given system, can be understood and so controlled.

The preferential adsorption of acid carbons for basic materials is now recognized as an important factor in the retardation of the drying of paints. In Table 2 are shown the comparative adsorption characteristics of carbons "L," "P," "J," and "Q" for cobalt, manganese, and lead from their naphthenate solutions in petroleum solvents.[6] These metals are commonly used as paint driers, and the differences, which are marked, are to be ascribed to the combined action of *p*H and of particle size.

TABLE 1. PROPERTIES OF CARBON USED IN THIS STUDY

Carbon	*p*H*	X†	V‡	Type of Carbon
"A"	11.2	4.5	0.2	Super Deactivated Colloidal Carbon (HS-332)
"B"	9.3	2.5	0.7	Furnace Carbon ("Fumonex")
"C"	9.1	2.6	0.7	Furnace Carbon ("Gastex")
"D"	8.2	4.1	0.6	Acetylene Carbon ("Shawinigan")
"E"	8.2	1.1	0.6	Thermal Carbon ("P-33")
"F"	6.9	3.9	0.8	Acetylene Carbon (German)
"G"	6.0	6.0	3.4	Deactivated Colloidal Carbon (1AAA)
"H"	5.7	5.3	3.4	German Carbon (CK-3)
"I"	5.5	8.0	3.7	Mildly Deactivated Colloidal Carbon (1AA)
"J"	5.2	44.1	7.2	High Color Colloidal Carbon ("Super Spectra")
"K"	5.0	51.8	6.0	Medium Color Colloidal Carbon ("Superba")
"L"	4.8	8.6	4.2	"Quick Curing" Colloidal Carbon ("Ultramicronex")
"M"	4.6	17.3	4.2	Special Colloidal Carbon (95-R)
"N"	4.5	10.1	5.0	Standard Colloidal Carbon ("Micronex")
"O"	4.4	10.0	5.1	Easy Mixing Colloidal Carbon ("Micronex W-6")
"P"	3.8	16.8	5.6	"Slow Curing" Colloidal Carbon ("Micronex Mark II")
"Q"	3.1	96.0	12.8	Highest Color Colloidal Carbon ("Royal Spectra")
"R"	2.6	58.4	12.0	Long Ink Colloidal Carbon ("Peerless")

*p*H = Sludge *p*H.[4]
†X = Adsorption Index.[4]
‡V = Volatile Matter.[5]

TABLE 2. ADSORPTION OF METAL NAPHTHENATES BY CARBONS FROM PETROLEUM SOLVENT

Carbon	Parts as Metal Adsorbed per 100 Parts Carbon		
	Cobalt*	Manganese*	Lead†
"L"	0.8	0.9	3.0
"P"	1.2	1.4	5.3
"J"	2.6	2.6	11.6
"Q"	4.3	3.9	21.0

*End concentration in solution 0.05-part per 100 of solution.
†End concentration in solution 0.50-part per 100 of solution.

A similar adsorptive behavior toward soluble zinc seemed probable, and in Table 3 are shown values obtained in these laboratories for zinc laurate adsorbed from 0.7% solutions in benzene by carbons "L" and "P."[7] It will

[1] Abstracted from the article which appears in the "Proceedings of the Rubber Technology Conference."
[2] Columbian Carbon Co. and Binney & Smith Co., 41 E. 42nd St., New York, N. Y.
[3] Wiegand, *Ind. Eng. Chem.*, 29, 953 (1937).
[4] Wiegand and Snyder, *Ibid.*, 23, 646 (1931).
[5] Wiegand and Snyder, *Rubber Age (New York)*, 29, 311 (1931).
[6] In all cases the metallic soaps were adsorbed, but values have been calculated back to the metal content.

be seen that carbon "P" shows an increased capacity for zinc removal, closely paralleling its behavior with cobalt, manganese, and lead. The next step was to attempt an order of magnitude calculation as to the corresponding requirements of the same carbons for zinc dissolved in rubber. This was done with two assumptions as regards zinc left in solution in the rubber, first, for an estimated minimum residuum of 0.25% zinc and, second, for a residuum of 0.8%, in both cases quantities being calculated to 100 parts of rubber, and for a 50% carbon tread.

TABLE 3. ADSORPTION OF ZINC LAURATE BY COLLOIDAL CARBONS FROM BENZENE SOLUTION

Carbon	Parts Zinc as Metal Adsorbed by 100 Parts Carbon
"L"	0.3
"P"	0.5

The results shown in Table 4, subject to the reservations indicated, supplied theoretical zinc oxide requirements for comparison with rubber compounding and vulcanizing data.

TABLE 4. THEORETICAL ADSORPTIVE REQUIREMENTS OF CARBONS FOR SOLUBLE ZINC IN 50% MERCAPTOBENZTHIAZOLE TREAD
(All Values on 100 Rubber)

Carbon	*p*H	ZnO Adsorbed for .025% Left in Solution	Corresponding Total ZnO Required	ZnO Adsorbed for 0.8% Left in Solution	Corresponding Total ZnO Required
"L"	4.8	0.3	0.6	0.5	1.3
"P"	3.8	0.6	0.9	0.9	1.7

NOTE: Above calculations involve the following assumptions:
(1) Adsorption from rubber equals adsorption from benzene.
(2) Adsorption isotherm of Zn has same trend as isotherm for cobalt.
(3) No compensation made for hydrolytic adsorption.
They are therefore only "order of magnitude" values.

In addition to adsorption of zinc, also to be taken into consideration are the adsorptive capacities of various carbons for accelerators.

The measure of this tendency, in respect of D.P.G., is the so-called "X" value which is influenced both by *p*H and particle size.[3] These "X" values, together with *p*H, are shown in Table 1.

The data of sections I and II of the original paper will now be critically reviewed.

Rubber-Sulphur Compounds

The fact that without exception carbon blacks ranging from the ultra-rubber type to the finest particle color blacks, and varying in *p*H from 5.5 to 3.1, all accelerated vulcanization as determined by physical properties, coupled with the fact that this accelerating tendency did not run parallel either to *p*H or to particle size, suggests that we may here be dealing with a phenomenon in which vulcanization and reenforcement are interrelated.[8]

The effect of selective adsorption in the removal of naturally occurring accelerators, or of naturally occurring fatty acids, must for the same reason be discarded as a prime factor in carbon acceleration. This accelerating behavior of colloidal carbon is being made the subject of further study in these laboratories.

The accelerating effect of zinc stearate on the unpigmented mixing can be explained by the activating effect on the naturally occurring accelerators. The fact that this acceleration is less marked in the case of the carbon mixings can be ascribed to the adsorptive removal of soluble zinc by the carbon. It is interesting to note that, even in the presence of zinc stearate, carbons "L" and "Q" vulcanized more quickly than the pure gum mixing, and carbon "J" had approximately the same time of vulcanization. The accelerating effect of the colloidal carbon, *per se*, prevailed over the depressing effect of the carbon on the zinc activation effect.

The coexistence of organic accelerators and the carbon accelerator leads to adsorptive disturbances which are no doubt responsible for the prevailing opinion that carbons are retarders of vulcanization.

Diphenylguanidine and Basic Accelerators

Disturbances of D.P.G. vulcanization may occur either by adsorptive removal of the accelerator or by removal of the activating zinc oxide. The fact that, as seen in Figure 1, carbons with *p*H readings higher than 7 actually accelerate D.P.G. mixings represents the sum of the natural accelerating tendency of the carbon, and a tendency to adsorb zinc and accelerator. To this may be added the possibility that, by hydrolytic adsorption, basic or high *p*H carbons are capable of splitting up any neutral salts present in the rubber compound (such as sodium chloride) with the release of free hydroxyl ions, which in turn would tend to accelerate.

Turning now to carbons on the acid side with *p*H of 5 or less, we may expect interference with the D.P.G. vulcanization in two stages: first, the removal of accelerator as being more basic, the immediate effect being retardation; second, in the case of still lower *p*H carbons the removal of soluble zinc, the result of which, by interference with the activation reaction, would be to bring about not only retardation of vulcanization, but also deterioration of quality. Fatty acid requirements in D.P.G. treads will on this view depend on the extent to which the carbon has depleted soluble zinc. With standard carbons (*p*H 4 to 5) the slight removal of zinc can be corrected by minimal additions of fatty acid (1 to 2% on the rubber) and larger additions play no constructive role, but, on the contrary, dilute and depress physical properties. On the other hand, with low *p*H carbons (3 to 4) the addition of 4% stearic acid was found necessary to correct the deficiency in soluble zinc with resulting im-

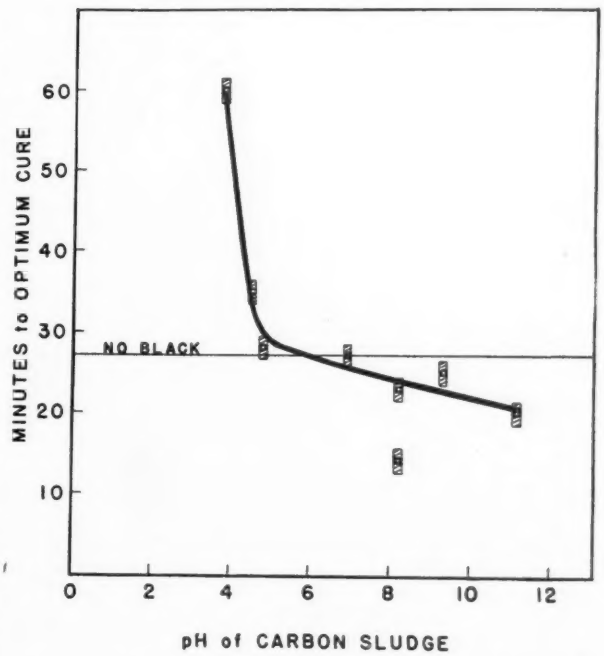


Fig. 1. *p*H of Carbon vs. Optimum Cure—D.P.G. Compound

[7] 6.7 g. of zinc laurate were dissolved in one litre of benzene. 40-g. portions of carbon were added to 300 c.c. of this solution and shaken for two hours. The carbon was filtered out, and 50 c.c. of the filtrate evaporated to dryness, and the residue determined. 50 c.c. of a blank without carbon treatment were also determined. The difference between the blank residue and the carbon treated residues gave the adsorption of zinc laurate by the carbon and from this the % of zinc metal adsorbed was calculated.

[8] Twiss wrote "Vulcanization and reenforcement are akin," *Trans. Inst. Rubber Ind.*, 9, 279 (1933).

provement both as regards quality and rate of vulcanization.

Litharge

That the effectiveness of litharge as an accelerator depends on its being present in soluble form is well established. The adsorptive capacity for various carbons in respect of lead soaps, shown in Table 2, explains the poor vulcanization resulting in litharge compounds which contain only the natural fatty acid present in the rubber. The finer the particle size and the lower the *p*H of the carbon, the more marked will be this effect.

Conversely, all carbons can be brought to a vulcanization satisfactory both as to rate and quality through the addition of increasing amounts of soluble lead by way of increased fatty acid dosages, to correspond with the total requirements of the carbon, as determined by its *p*H and particle size.

In litharge compounds where accelerator and activator are identical and present in excess, the provision of lead soap in amount sufficient for the adsorptive requirements of the most diverse carbons corrects all disturbing factors with the result that litharge compounds are unequalled in the elimination of vulcanizing differences throughout the whole range of carbon pigments.

Although least sensitive to carbon differences, litharge compounds are, for the reason mentioned above, exceedingly sensitive to any deficiency in fatty acid.

Mercaptobenzothiazole and Acid Accelerators

In mercaptobenzothiazole compounds adsorption relations are quite different from those obtaining in the case of litharge or diphenylguanidine. Acid carbons which adsorb more D.P.G. than basic carbons of similar particle size adsorb less mercaptobenzothiazole than do basic carbons, as shown in Table 5.

TABLE 5

Carbon	*p*H	% Mercaptobenzothiazole Adsorbed from 0.01 Normal Solution in Alcohol
"N"	4.5	14.4%
"A"	11.2	18.9%

If accelerator adsorption were the controlling factor, high *p*H carbons would retard vulcanization in mercaptobenzothiazole compounds more than do low *p*H carbons. Since this is not the case, the situation as regards soluble zinc becomes most important, and this for two reasons. In the first place the acidic carbon now selectively adsorbs zinc, and in the second place the requirements of soluble zinc are greater. To the amount adsorbed by the carbon is needed the additional amount to form the zinc salt of the accelerator. A residuum of zinc oxide is required for vulcanization activation and to neutralize any free fatty acid developed by hydrolytic adsorption (carbon) or chemical reaction (accelerator).[9]

The problem of proper zinc and fatty acid balance for mercaptobenzothiazole tread compounds has been approached from two angles: first, the determination of fatty acid requirements in the presence of excess of zinc, and, second, the determination of zinc requirements in the presence of normal fatty acid content. The facts clearly show that a deficiency either in zinc or in fatty acid depresses mercaptobenzothiazole vulcanization through shortage in soluble zinc. An excess of either ingredient will not compensate for a deficiency in the other.[10] With respect to its reaction to excess fatty acid, mercaptobenzothiazole is more like litharge than like diphenylguanidine in that, unlike the basic accelerators which are sensitive to excess of fatty acid, mercaptobenzothiazole is sensitive to shortage.

Soluble Zinc Requirements and the Mono-Layer Theory

Experiments on the adsorption of zinc laurate from benzene solution (Tables 3 and 4) have been made the basis for a rough calculation as to total addition of zinc oxide required on the assumption that a residuum of 0.8% of zinc in solution in the rubber is essential for vulcanization activation. The value for carbon "L" was 1.3% (on the rubber) and for carbon "P," 1.7%. These calculated values are in general agreement with the minimum zinc requirements for proper vulcanization development with the same carbons (Figure 2. The possibility that carbon reenforcement of rubber is best promoted when there is present a mono-layer of stearic acid surrounding each carbon particle has found support.[11, 12] The mono-layer requirements for carbons of varying particle size[12] indicate for standard rubber carbons[13] a stearic acid dosage of approximately 10% by weight on the carbon, and these proportions rise to over 30% for high color carbons.

Now, if the further assumption be made that the adsorptive requirements of a low *p*H rubber carbon ("P") will be satisfied when it is surrounded by a mono-molecular layer not of stearic acid, but of zinc stearate, a simple calculation reveals that for a 10% fatty acid dozage the corresponding zinc oxide content will be 1.4% by weight on the carbon or 0.7% by weight on the rubber in a 50% carbon tread.

The fair agreement between this value and the value (0.9) derived from direct adsorption experiments (Table 4) and from the empirical requirements as revealed in Figure 2 would seem, as a first approximation, to sup-

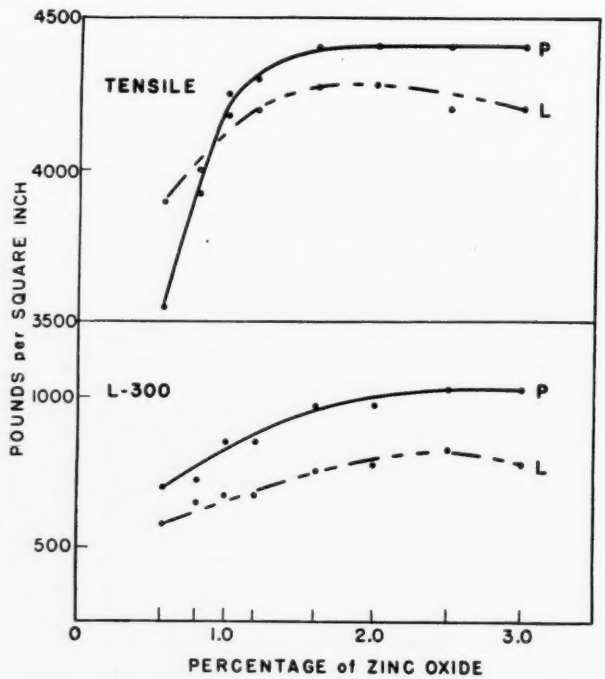


Fig. 2. Zinc Oxide vs. Cure—Mercapto Tread

[9] The necessity of zinc in excess of the amount required to form the zinc salt of mercaptobenzothiazole has been pointed out, Twiss, Brazier, and Thomas, *J. S. Chem. Ind.*, 41, 81T (1922).

[10] The effect of still higher zinc oxide dosage (e.g. 50%) is excluded, since such proportions are not found in high carbon compounds.

[11] Blake, *Ind. Eng. Chem.*, 20, 1084 (1928).

[12] Wiegand, *Can. Chem. Met.*, 21, 2 (1937).

[13] Assuming a carbon particle size of 0.06-micron.

port the view that the vulcanizing behavior of acidic rubber carbons is likely to be most satisfactory when fatty acid and zinc are present in amounts required for the development of the above-mentioned mono-layer of zinc stearate, plus, of course, a residuum for vulcanization activation.

For any given particle size of carbon, ideal mono-layer disposition presupposes strong attractive forces as between carbon and zinc and is thus dependent on low *p*H. A decrease in these attractive forces, as represented by higher *p*H values, would be expected to show a progressive diminution in the density of packing of the zinc stearate molecules.

When the *p*H of the carbon rises above the neutral point, the necessity of a bridge between carbon and the carboxyl end of the fatty acid molecule will disappear, and a satisfactory reenforcement bond can be pictured with the hydrocarbon end of the fatty acid attached to the rubber, and its carboxyl end attached to the basic (high *p*H) carbon surface.

Empirical Approach to Zinc, Fatty Acid, and Accelerator Balance

Owing to the fact that *p*H and particle size are independent variables, offering many combinations, blanket rules are impossible of formulation. Each carbon presents an individual colloidal adsorption picture. Any change, either in its *p*H or in its particle size, offers, in turn, a fresh compounding problem.

As a first step it is suggested that with zinc oxide present in excess (5%), fatty acid dosage be systematically varied to optimum properties. A slight excess must be added to allow for crude rubber variability. With fatty acid thus determined zinc oxide may gradually be reduced to the point beyond which the physical properties of the vulcanized rubber begin to suffer. Additional zinc oxide should then be added to allow for variation in carbon or other ingredients. Lastly, accelerator dosage should be adjusted to practical requirements of vulcanization rate, antioxidant effect, and so on. It is believed that such a sequence will best bring out the vulcanizing properties of colloidal carbons at minimum expense.

Where pine tar is used as softener or dispersing agent, its acid characteristics should be taken into consideration during the adjustment of fatty acid content.

Conclusions

1. Experiments with rubber sulphur mixings showed that colloidal carbons accelerated vulcanization instead, as generally stated in the literature, of retarding. The fact that this acceleration was found to be independent of the *p*H value of the carbon suggests that the carbon rubber reenforcement "reaction" and (physical) vulcanization may be related phenomena.

2. When colloidal carbon is used, as in tire treads, in conjunction with other accelerators, disturbances occur due to the selective adsorption properties of the carbon colloid. These disturbances, which are greatest with basic organic accelerators, less with acidic organic accelerators, and least with inorganic accelerators such as litharge, have led to the description of colloidal carbons as quick or slow vulcanizing.

3. The best guide to this "rate of vulcanization" characteristic of rubber carbons is their *p*H value.

4. Adsorption data are given for cobalt, manganese, lead, and zinc soaps and vary widely for different colloidal carbons. This variation as to the zinc requirements was confirmed by a rubber compounding series. Thus each carbon, depending on its *p*H and particle size, presents an individual problem in adsorptive requirements, involving fatty acid, zinc oxide, and accelerator, which should be adjusted in this order.

5. For use with basic accelerators (e.g., D.P.G.) colloidal carbons of maximum surface (which involves high fatty acid additions with resultant interference with the accelerator) or carbons with low *p*H (which requires high soluble zinc and, therefore, high fatty acid) are not recommended. Low *p*H carbons tend to disturb the alkalinity essential to best results and to absorb the accelerator.

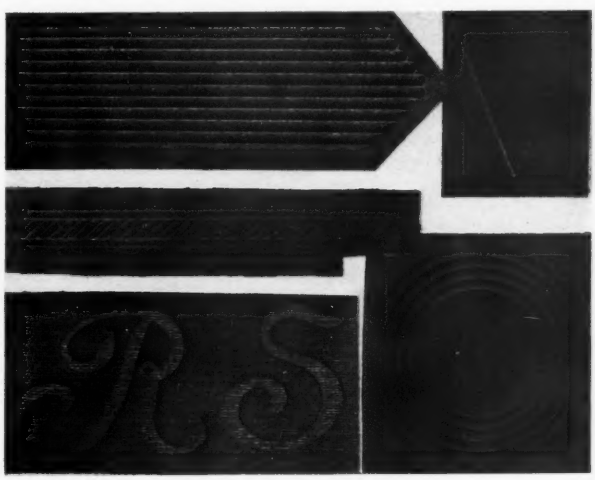
6. With acid accelerators (e.g., mercaptobenzothiazole), the finer colloidal carbons of moderate to low *p*H may safely be used. The higher fatty acid dosage (soluble zinc) which these carbons require can be freely supplied since it does not deactivate the accelerator.

7. For use with litharge, the widest range of colloidal carbons is permissible, extending even to the finest particle high color carbons of *p*H 3, provided fatty acid (and, therefore, soluble lead) is present in amount sufficient for the *p*H and surface requirements in each case.

Rubber Process for Upholstery Designs

THROUGH the use of rubber and a new continuous vulcanizing process it is possible to emboss economically a wide variety of designs into cloth, leather, or imitation leather. The process, which was developed by National Automotive Fibres, Inc., Detroit, Mich., comprises essentially placing under the cloth or leather the proper type of rubber compound and vulcanizing the design into the cloth by applying under pressure on the cloth side, a hot die of the required shape and design. For the application of strip designs on long lengths or on continuously-fed short pieces a continuous electrically heated vulcanizing unit is employed; while a quick operating semi-automatic press with a suitable die is used for flat panel work. The vulcanizer for long lengths utilizes continuously traveling wires or a suitably designed flat band to produce the desired impressions in the cloth.

The process is said to be simple and inexpensive as compared with sewing methods, and the design is claimed to be permanent. While intended for the automotive field, this development should find other applications.



Cloth with Rubber-Vulcanized Designs

Editorials

Outlawing the Sit-Down

AT LAST, verification of the illegality of the sit-down strike as practiced by the Congress for Industrial Organization has been made by the United States Supreme Court through its recent decision. It is scarcely believable that in the United States, where straight thinking is supposed to predominate, the high government officials and those responsible for the execution of justice could possibly overlook and condone so long this past practice thereby delaying the clarification until action could be taken by the Supreme Court.

Exemplary evidence of the beliefs, which did and rightly should have existed, can be found in a statement made by a vice president of the American Federation of Labor after the court decision, "We had no doubt as to the illegality of the sit-down strikes when they first developed out in the automobile factories in Michigan. We had no doubt as to the fallacy of the sit-down strike from an economic point of view."

Procrastination in making effective the outlawing of seizure, of which the ultimate outcome should have been evident, has delayed business recovery through its effect upon the relations between labor and management. The lesson taught by this fiasco should have an influence upon future consideration of experiments which may be contrary to fundamental laws of economics and justice.

Industrial Tax Burden

ANALYSIS of the financial statements for 1938 of three rubber companies, which are probably representative of the medium and larger organizations, reveals the magnitude of the industrial tax burden.

One company, embracing 27,000 direct employes within the United States or 45,000 direct employes throughout the world and with 61,629 stockholders, paid a total of $9,317,786 as federal, state, and local taxes during the last calendar year. This annual tax amounted to the equivalent of $345 per employe on the United States payrolls, or $4.53 per share of common stock outstanding. Likewise this company's world tax bill of $17,563,472 aggregated 36% of its world wages and salaries.

A second company paid in 1938 taxes amounting to approximately $7,300,000, or the equivalent of 6.3% of the net sales. If distributed among the common stockholders, this tax would represent $5.61 a share.

A third and still smaller company disbursed in federal, state, and local taxes $1,601,510 which was equivalent to approximately $3.65 per share on the outstanding common stock and represented 38% of their total payroll.

From the combined statistics for these three companies it is observed that their total United States taxes of more than $18,000,000 would have averaged $4.80 per share if it could have been distributed to the approximately 3,800,000 shares of common stock, which is popularly held. Likewise, if this tax expenditure could have been equally apportioned among the employes of the three companies, a very substantial amount would have been available for the family budget of each employe.

Of course it would be impossible to eliminate entirely these taxes as government, under the best conditions, must involve some expense. However most individuals do not realize the tremendous increase in governmental expense and taxes during the past six years.

The tax burden, whatever it may be, must eventually be borne by the consumer class which includes everyone, wage earner and stockholder alike who in many instances are identical. Taxes are necessarily included in the cost of the product, but because of their non-identity in the purchase price of goods, the average citizen does not realize the full extent of the financial influence of taxes upon his daily life. In addition to the taxes imposed directly on industry and thus indirectly on the consumer many other taxes contribute to the summary effect on the individual resulting from the cost of government.

Disclosure of the present hidden taxes would not suffice to make evident the full import of the situation for, even if expenditures were immediately limited to income, still greater revenue will be needed to reduce the annual interest charges of about $1,000,000,000 on present government indebtedness incurred by the people's representatives who are subject to recall by the people.

One might ask, "What can be done to remedy the situation?" We need only to study the methods existing previous to the last decade when employment was ample and a far greater volume of business and other activities were being conducted by private or local public organizations. Instead of being used for relief, interest, and governmental regulation of our lives, the monetary circulation then resulted in the production and distribution of a greater amount of material goods than it is possible for the general public to enjoy today. The people individually are responsible for this fast growing indebtedness, which has no alternative except eventually still higher taxation, unless they take it upon themselves individually to instruct their representatives as to the objectives expected from these public servants.

EDITOR

What the Rubber Chemists Are Doing

A.C.S. Rubber Division Activities

Spring Meeting

THE American Chemical Society will hold its spring meeting April 3 to 7 at Baltimore, Md. The Rubber Division, with headquarters at the Emerson Hotel, has scheduled its sessions for April 4 and 5. The banquet will be held April 4 in the main ballroom. General Hugh S. Johnson has been invited to speak on current events. V. L. Smithers, of Akron, in charge of the dinner arrangements, has promised other special entertainment.

The technical sessions will open at 9:00 a.m., April 4, with introductory remarks by Chairman G. K. Hinshaw. The remainder of the day will be devoted to 12 papers comprising the Symposium on Synthetic Rubber and Elastic Polymers. The general sessions, set for April 5, include 10 papers on diversified topics and will close with a report of the Crude Rubber Committee by R. H. Gerke. Abstracts of the 22 papers follow.

Plasticization of Neoprene Type G. Neoprene Type G, made by the polymerization of chloroprene in emulsion under carefully controlled conditions, can be plasticized to any desired degree by milling, especially under water, or by means of suitable chemicals. Alkaline materials such as di-*o*-tolylguanidine are especially effective plasticizing agents. Data are presented on the degree of plasticization and the stability with various amounts of the agents. A considerable number of chemicals commonly used in the rubber industry are effective plasticizing agents, but a few of them have a deleterious influence on some of the properties of the cured Neoprene. The use of the guanidines, especially di-*o*-tolylguanidine, is recommended. Data obtained with two different modifications of this type of Neoprene are shown. The more readily plasticized, Neoprene GCX, is recommended for water plasticization or for chemical plasticization when an especially plastic material is desired. Neoprene GCR can readily be softened chemically to the range of plasticity desirable for more practical processes. Howard W. Starkweather and Mortimer A. Youker, E. I. du Pont de Nemours & Co., Inc.

The Effect of Pigmentation on Neoprene Type G Compounds. It is shown that the swelling of Neoprene vulcanizates in a given solvent is dependent upon the dilution of the vulcanizates by the compounding pigments and not upon the moduli of the vulcanizates. The state of cure of the vulcanizate also has some significance on the amount of swelling in a given solvent. The effect and relation of commercial compounding pigments on resilience, compression under load, A.S.T.M. compression set and Shore hardness are shown. With a given pigment the resilience will decrease as the pigment loading is increased. In this work use is made of the Yerzley oscillograph. Neil L. Catton and Donald F. Fraser, Rubber Chemicals Division, Organic Chemicals Dept., du Pont.

The Effect of Various Modifying Agents on Neoprene Type G. The term modifying agent is used to designate materials which in rubber are normally considered as activators, accelerators, or vulcanizing agents. Their effect on the modulus, tensile strength, resistance to tear, hysteresis properties, and rate of cure in a Neoprene tread type of compound are discussed. Included in the list of materials tested are various concentrations of Catechol, b-napthoquinone, Captax, triethanolamine, di-ortho-tolyl-guanidine, butyraldehyde-mono-butylamine condensate, zinc chloride, sulphur, and stearic acid. The effect of metallic oxides and their concentration are also discussed. Maynard F. Torrence and D. F. Fraser, Rubber Chemicals Division, Organic Chemicals Dept., du Pont.

Neoprene Cements. Data are presented regarding the viscosity and stability of Neoprene cements in benzene containing up to 30% total solids. Although the more concentrated cements have only limited stability, especially at elevated temperatures, those up to 15% concentration are sufficiently stable for practical purposes. Cements made from Neoprene Type G are slightly less stable than those made from Neoprene Type E, but up to 17% concentration are still usable after five months' storage at room temperature. Compounding somewhat reduces the stability of concentrated cements. The addition of sodium thiosulphate during compounding improves the stability of Neoprene Type E cements. Diphenyl guanidine lowers the viscosity of Neoprene Type G cements, but renders them slightly less stable.

The viscosity of cements for any given solvent or concentration varies with the plasticity of the Neoprene. The variation of the intrinsic viscosity determined in different solvents makes the calculations of molecular weights from this type of data extremely uncertain. H. W. Starkweather and Frederick C. Wagner, du Pont.

Adhesion of Neoprene to Metal. Modifications of the A.S.T.M. standard adhesion test are introduced as a means of controlling both the pressure and flow during vulcanization of test specimens. In addition, by the use of a relatively thin layer of vulcanizate, nominally ⅛-inch thick, it is shown that a yield point develops in the load-elongation curve revealing internal failure of test specimens in many cases well before their ultimate strength is recorded. Adhesion of Neoprene Type E to brass is used as a means of evaluating the test and of demonstrating factors of commercial importance. A procedure is developed for the use of chlorinated rubber as a Neoprene to metal adhesive, and it is shown to be applicable to steel, 18-8 stainless steel, copper, and aluminum. The best adhesion obtainable between Neoprene and metal by the use of chlorinated rubber is equivalent in strength to adhesion to brass. Felix L. Yerzley, Organic Chemicals Dept., du Pont.

Recent Advances in the Application and Technology of the Buna Rubbers. Dr. Albert Koch, I. G. Farbenindustrie. (Abstract not yet available.)

The Nomenclature of Synthetic Rubbers. A brief history of synthetic rubbers and of synthetic rubber-like substances is given, together with an outline of the reasons for the continued use of the term synthetic rubber, especially for the rubber-like polymers of butadiene and its derivatives, including chloroprene. Recent and new class terms for rubber-like substances are given, and their use discussed. The new term *elastomers* is suggested to cover all rubber-like substances, *elastoprenes* for the diene polymers, and *thiolastics* for the polyethylene sulphides ("Thiokol"). It is also suggested that Stevens' term *elastoplastics* be used for the growing class of rubber-like plastics as

plasticized vinyl chloride (Koroseal), certain polyacrylic esters, etc. *Plastomer* is used for the true and the thermosetting thermoplastics. A classification of all rubber-like substances is given in a table. Harry L. Fisher, U. S. Industrial Alcohol Co.

Chemical and Physical Research in the Field of Polymerization. This review paper has as its primary purpose the presentation of sufficient data to demonstrate the close tie-in between chemistry and physics in the present-day study of the formation and properties of rubber-like polymers. Particular attention is devoted to the physical research angle to arouse more interest among physicists in the theoretical aspects of polymerization as well as to indicate to the chemists the value of cooperative research with physicists on the problems of polymerization by acquainting them with what has been accomplished in this way.

From the chemical standpoint attention is directed toward such conclusions as may be drawn from a collection of facts relating to the process of polymerization. These facts include examination of the types of substances which will polymerize, the mechanism whereby polymerization occurs, the relation between molecular structure and the rate and degree of polymerization. The effect of unsaturation, polarity, etc., of the monomers on the resultant polymers, the dependence in general of polymer properties on the monomer types.

From the physics standpoint the most important methods of physical research which have been applied to synthetic polymers and the processes of polymerization are discussed, with most attention paid to polymers which can display high elasticity. Each method is taken separately, and after a very brief introduction to the underlying theory some representative applications of the method are illustrated. The illustrations are chosen insofar as possible to bring out the type of information which can be obtained and to indicate the present status of the work.

The physical research covered includes investigations on elasticity and plasticity, X-ray diffraction, electron diffraction, double refraction, light scattering, electrical properties, and thermodynamics. The viscosity and osmotic pressure phenomena with solutions are discussed as well as molecular weight determinations with the ultracentrifuge. S. D. Gehman, H. J. Osterhof, and L. B. Sebrell, Goodyear Tire & Rubber Co., Akron, O.

Recent Developments with Koroseal. Koroseal plastics exhibit a wide range of physical, chemical, and electrical properties which can be modified by the use of suitable plasticizers, loading pigments, and special compounding ingredients. Essentially rubber-like, Koroseal stocks may be milled, calendered, extruded, and molded without vulcanization into a variety of enduring products. Koroseal is especially valuable for uses requiring resistance to water, acids, alkalies, oxidizing agents, and corrosive chemicals. F. K. Schoenfeld, A. W. Browne, Jr., and S. L. Brous, The B. F. Goodrich Co., Akron, O.

Vapor Pressures and Accommodation Coefficients of Four Non-Volatile Compounds. The Vapor Pressure of Tri-meta-cresyl Phosphate over Polyvinyl Chloride Plastics. The vapor pressures and accommodation coefficients of the non-volatile organic compounds useful as plasticizers are data of fundamental importance in interpreting the losses of plasticizer which occur from plastics under certain conditions. Vapor pressure data have been obtained for di-*n*-butyl phthalate, tri-*m*-cresyl phosphate, tri-*p*-cresyl phosphate, and dibenzyl seacate. The vapor pressures of tri-*m*-cresyl phosphate over a number of polyvinyl chloride plastics have been determined. It is concluded that the vapor pressure of the plasticizer in these plastics is independent of concentration over the range 15 to 100% plasticizer. Frank H. Verhoek and A. L. Marshall, The General Electric Co.

A Comparison of the Commercial Polysulphide Rubbers. The polysulphide rubbers sold under the trade mark of "Thiokol" comprise a group of compounds made by interacting organic dihalides with inorganic polysulphides. By changing these reactants many different compounds can be produced; thus, many different "rubbers" are possible. These possess distinct and characteristic properties. Types A, B, D, and DX give stocks normally classed as soft rubber. Products can be produced that give stocks resembling hard rubber. In general these types show a low percentage swell in the more common organic solvents. They all possess excellent aging characteristics. In addition Type A has very low moisture absorption.

These polysulphide rubbers are plasticized with such materials as Tuads and Altax. As little as 0.001% exerts a noticeable effect on the plasticity of the stock. Zinx oxide in amounts of from 5 to 10% improves the quality of the vulcanizate. The semi-reenforcing carbon blacks are the most satisfactory reenforcing pigments. In general the white pigments do not reeforce so well as the soft and semi-reenforcing carbon blacks. However zinc oxide and blanc fixe give satisfactory white stocks.

These polysulphide rubbers are being used to replace natural rubber where their peculiar properties enable the compounding of a better stock for a given purpose than can be obtained with natural rubber. S. M. Martin, Jr., Thiokol Corp.

Plastics in the Cable Industry. The application of synthetic elastic polymers in the cable industry is discussed with general reference to their value as complementary materials to rubber and other insulations and as substitutes for materials now in use where their properties would provide superior products. Among the materials reviewed are polysulphide rubber, butadiene rubbers, polymerized saturated hydrocarbons, Neoprene, plasticized polyvinyl chloride, plasticized copolymers of polyvinyl chloride and acetate, cellulose plastics, acrylic acid esters, polystyrene, and mention is made of rubber derivatives. No attempt is made to evaluate one material to another, but by taking rubber as a standard the properties of each are weighed against this material familiar in properties and use. The importance of plasticizers in effecting improvements in electrical and physical properties is noted, but no attempt is made to review this field of work. An attempt is made to postulate a specification for an ideal plastic. R. A. Schatzel and G. W. Cassell, General Cable Co.

The Variability of Plantation Latex. I. Surface Tension. The effect on surface tension of tapping sytems, part of the alternate monthly tapping month, soil or individual differences between trees, manuring, or temperature at which latex is aged has been found to be commercially negligible (standard deviation not greater than 0.2 dyne per cm.) for 1.25% ammonia latex. Statistically significant seasonal effects are indicated, but in the present experiments cannot be distinguished from consistent errors in technique which may vary with time. The surface tension of NH_3 latex always drops with aging. The reproducibility of the determination corresponds to a standard deviation of the order, 0.5 dyne per cm. D. S. Villars, United States Rubber Co.

***Hevea* Latex of Large Particle Size.** Modified *Hevea* latices have been made by creaming and centrifugation processes. The nitrogen content of these latices depends upon the total surface of the latex particles. Thus it is demonstrated that it is possible to fractionate latex into portions containing different average particle diameter resulting in definitely different nitrogen values, thus producing a latex particularly well adapted for waterproofing and insulating purposes and one that when coagulated will give a highly purified rubber. J. McGavack, U. S. Rubber.

A Method of Determining the Distribution of Flock Size in the Creaming of *Hevea* Latex. The observed concentration gradient upward throughout *Hevea* latex, as it creams under the influence of added creaming agents, is used to estimate flock-size distribution, by a modification of usual sedimentation methods. The results obtained on the same latex by two differently acting creaming agents appear to be explainable by the different distributions of flock-size which result. The creaming agent, which under identical conditions produces a cream of higher rubber con-

tent, causes a wider distribution of flock size which would enable a tighter ultimate packing. The theory would still hold even if a semi-thixotropy were set up at some time during the progress of creaming. E. M. McColm, U. S. Rubber.

Sol and Gel in *Hevea* Latex and Crude Rubber. Influence of Oxidation on Gel—Sol Transformation. An apparatus and procedure to determine the amounts of sol and gel rubber in dried latex films and crude rubber have been described. It is shown that while plantation smoked sheet and crepe contain large and varying quantities of rubber soluble in petroleum ether, dried rubber films from latex are practically free from sol rubber when oxidation has been avoided. This throws doubt on the conclusion that the rubber particles in fresh latex possess a fluid sol rubber center as generally believed. Latex increases in sol rubber content when subjected to various treatments permitting oxidation of the hydrocarbon. It appears from this work that the rubber in the form of latex is very susceptible to oxidation which, however, involves only minute quantities of combined oxygen.

When latex film rubber is subjected to creping, it shows an increased content of sol rubber corresponding to that of crepe. A short milling of crepe was found to convert it completely into sol rubber which confirms the gel-sol transformation mechanism of breakdown.

Gel rubber from dried latex films is swelled to a maximum of 1500 to 7800%, but is not dissolved when placed in benzene, chloroform, carbon tetrachloride, and carbon disulphide and allowed to stand for several days. Gel becomes soluble and therefore diffusible in these solvents as a result of oxidation.

It was found that dried latex film and various types of crude rubber swelled to a maximum of 1000 to 2400% in petroleum ether and that this swelling was not proportional to the sol content. This investigation strengthens the belief that sol rubber is an oxidation product of gel. The formula for sol rubber is suggested as $(C_5H_8)_nO_2$ and a relation between the molecular weight and the oxygen content is postulated on the basis that oxygen acts as a molecular splitting agent for both gel and sol. A. R. Kemp and H. Peters, Bell Telephone Laboratories, Inc.

The Colloidal Structure of Rubber in Solution. Colloidal Aspects of Vulcanization. Colloidal changes in solutions of purified rubber due to a vulcanizing system consisting of piperidinium pentamethylene dithiocarbamate, sulphur, and zinc propionate have been followed by means of measurements of the depolarization and intensity of the transversely scattered light and by viscosity measurements. A study was made of the time required for vulcanization of benzene solutions of rubber using the above vulcanizing agents. The temperature coefficient of vulcanization was found to have approximately the same value as that for cures of solid stocks.

The light-scattering results are interpreted as showing that, upon the addition of the vulcanizing agents to the solutions, the colloidal units become larger. The decrease in viscosity is explained as being due to a diminished "interlocking" of the units. In the vulcanization of the solutions an equilibrium of colloidal processes occurs which results in a constant viscosity for the larger part of the time required for vulcanization although the light-scattering measurements show a continuous change. The magnitude of the light-scattering changes indicates that the molecular clusters in the gelled solution are probably not a great deal different from those in the original solution. The viscosity measurements show that the forces between the clusters have been radically strengthened. S. D. Gehman and J. E. Field, Goodyear.

Refractometer Studies on Rubber-Pigment Mixtures. Refractometric examination of rubber-zinc-oxide mixtures demonstrated that an increase in refractive index occurs when zinc oxide is milled in rubber, and the magnitude of the change is a function of the particle size and the amount of zinc oxide added. Latex-zinc-oxide experiments indicate that the phenomenon is associated with mastication as the increase in refractive index does not take place until the dried latex-zinc-oxide film is milled. When zinc oxide is dissolved from a rubber-zinc-oxide mixture, the refractive index is lowered to approximately the same value as unpigmented rubber. A fine particle size precipitated whiting in rubber increased refractive index although the change was not so great as with zinc oxide. Other pigments and fillers in rubber influence refractive index, but to a less extent than zinc oxide and precipitated whiting. The opacity of some pigments and the coarse particle size of others prevent a satisfactory examination of these materials by transmitted light. H. C. Jones, New Jersey Zinc Co.

The Composite Nature of the Stress-Strain Curve of Rubber. Evidence is presented to show that the stress-strain curve of rubber consists of three portions. The first and third portions present elastic rubber. The second portion which connects the other two represents a period during which the rubber flows in a plastic manner and transforms to a condition of greatly increased load-carrying capacity Hysteresis is largely confined to the second portion of the curve. Ira Williams, formerly with du Pont, now with J. M. Huber Corp., and B. M. Sturgis, du Pont.

Continuous Vulcanization of Belting. The older processes for vulcanizing rubber belting include the use of jaw-type presses, the product being intermittently drawn through the press as each succeeding section is vulcanized. The obvious faults of these processes have been reflected in the quality of the products. As early as 1859 a United States citizen residing in Scotland designed a continuous vulcanizer with a view of eliminating the disadvantages of the jaw press. This machine was a forerunner of other continuous vulcanizing machines, all of them failures in the manufacture of belting and other similar products. Recently a method was developed whereby rubber belting of any desired width, length, and thickness can be uniformly stretched, compressed, and vulcanized by means of a continuous process which results in a product of uniform physical and chemical characteristics throughout its length. John M. Bierer and T. M. Knowland, Boston Woven Hose & Rubber Co.

The Surface Chemistry of Rubber Carbon Blacks. In this work an effort was made to reduce the surface of various rubber carbon blacks to relatively the same surface condition. Samples were exhaustively extracted with acetone, benzene, and water successively, then tested in rubber. The results vary with each carbon. Samples were also heated in dry carbon dioxide-free nitrogen to 450° C., then tested in the same recipe under the same conditions as the first series, with equally varying results. High vacuum treatment at high temperatures had its greatest effect on channel black, which was expected, owing to the loss of C_xO_y complexes resulting in an increased rate of cure. A. W. Campbell, Commercial Solvents Corp.

Nitroparaffins and Chloronitroparaffins as Inhibitors of Gelling in Vulcanizing Cements. As a result of recent developmental work on the direct nitration of hydrocarbons, various nitroparaffins and derivatives thereof have become available. It has been found that 1-nitro-2-methylpropane, while not a solvent, inhibits the gelling of ultra-accelerated cements. The preferred compound, however, is 1-chloro-1-nitropropane, which has the effect of markedly delaying the gelling of ultra-accelerated cements. This development permits direct mill mixes and direct churnings of compounds that hitherto required the use of two part cements. A. W. Campbell, Commercial Solvents.

Detroit Group

THE February 24 meeting of the Detroit Group, Rubber Division, A.C.S., held at the University Club, Detroit, Mich., had a record attendance of 105 members and guests. The main speaker of the evening was R. O. Danse, metallurgist of the Cadillac Motor Division, General Motors Corp., who presented a very interesting and exclusive talk on the subject, "Rubber Testing as Evaluated by the Automotive Engineer," which covered the field of the

present available instruments and the development of more accurate and portable instruments in the Cadillac laboratory for testing of automotive parts.

Another paper on the program titled "Latex and Its Uses in Industry" was presented by Dr. J. Edwin Hutchman, of the Naugatuck Chemical Division, United States Rubber Co. Dr. Hutchman's talk was non-technical and covered mainly the various uses of latex, which was illustrated by several hundred articles made from latex, ranging from Lastex thread to bathing suits. This exhibit was comprehensive and viewed in detail by most of the members. Preceding Dr. Hutchman's talk a short movie depicting the Far Eastern plantations of the United States Rubber Co. was shown.

Boston Group

ON MARCH 3 the Boston Group, Rubber Division, A.C.S., met at the Restaurant Seville, 130 Boylston St., Boston, Mass., with 110 members and guests in attendance. After the dinner, Chairman Emil H. Krismann introduced the first speaker, Dr. Warren S. Lockwood, Director of Crude Rubber Development Bureau, Washington, D. C., who spoke on "New Uses of Rubber in Agriculture." He pointed out that the first farm-tractors using rubber tires as original equipment appeared only six years ago, but in 1937, 46% of the wheel-type tractors manufactured were rubber tired and 64% in 1938. Mr. Lockwood discussed the modes of farm transportation and the increasing application of rubber tires in the United States, France, Holland, and Great Britain. Recently at a demonstration in Wichita, Kan., 133 out of 135 tractors were rubber tired. Tractors with rubber tires are now built capable of a speed of 40 miles per hour. He predicts the rapid growth of the use of two-wheeled carts with rubber tires on the farms in this country. Mr. Lockwood discussed farm applications of rubber other than haulage tires including: rubber-tired wheelbarrows, sponge rubber seats for tractors and farm implements, rubber hose and belting, milking machine tubing, rubberized drapers for combines, rubber canvas sheets for manure spreaders, rubber flooring for dairies, rubber horseshoes, pneumatic horse collars, and rubber shoes for cattle and sheep.

In the second paper of the evening on the subject "Shadows of Charles Goodyear in the Twentieth Century," William F. Tuley, Naugatuck Chemical Division, United States Rubber Co., 1790 Broadway, New York, N. Y., discussed the history and application of accelerators. He paid tribute to Charles Goodyear not only as the discoverer of vulcanization, but also for realizing the possibility of acceleration. As indicated in United States patent No. 3,633 issued to Goodyear in 1844, he recognized the improvement in the vulcanization process effected by the use of white lead and the oxides of lead. Dr. Tuley briefly summarized the accomplishments of George Oenslager who began his work on accelerators at the Diamond Rubber Co., Akron, O., in 1905. He discussed the mechanism of vulcanization reactions as suggested by Bedford and Winkelmann in 1924 and stated that the action of zinc oxide with litharge is similar to its effect with organic accelerators. Although the expansion of the field of organic accelerators really began in 1918 and 1919, the list of accelerator patents in the U. S. alone now totals over five hundred and covers the use of thousands of chemicals. Dr. Tuley presented a classification of present-day accelerators and discussed the growing trend toward the use of combinations of two or more accelerators. The chemist has been aided recently in the more accurate choice and application of accelerators by the development and widespread use of more precision tests such as plasticity, accelerated aging, atmospheric cracking, frosting, flex cracking, and the T-50. Slides were used to illustrate many of the points brought out in this paper.

A door prize of a Zenith radio purchased with the donations of the following companies was drawn by Ralph Huber: L. G. Whittemore & Co., Boston, Barrett Co., New York, Thompson, Weinman & Co., Inc., New York, C. P. Hall Co., Akron, Pequanoc Rubber Co., Butler, N. J., and Ernest Jacoby & Co., Boston.

Los Angeles Group

THE March 7 meeting of the Los Angeles Group, Rubber Division, A.C.S., was held in the Rainbow Room of the Mayfair Hotel, 1256 W. Seventh St., Los Angeles, Calif., with 78 members and guests present. The business meeting consisted of the reading of the minutes for the previous meeting and the approval of reports by the treasurer and committees on membership, reception, and prizes. A. D. McPherson reported on current events covering activities in the local rubber trade. New members and guests were introduced to those assembled. W. C. Holmes announced the plans for the April meeting at which H. J. Jordan of du Pont will speak and show a moving picture on Neoprene.

The first speaker, William Welch, president of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., was introduced by W. B. Reeder, of Samson Tire & Rubber Corp. Mr. Welch spoke briefly of the importance of reclaimed rubber in stabilizing crude rubber prices and the possibility of its assuming greater proportions in case the supply of crude were interrupted by an emergency. Mr. Welch then showed the picture, "Rubber Reborn," which had previously been presented before the Chicago, New York, Detroit, and Akron rubber groups of the A.C.S. and the Rhode Island Rubber Club. In appreciation of his presentation of the reclaiming picture Garvin Drew, president of the Group, presented Mr. Welch with rubber articles manufactured by the following local plants: W. J. Voit Rubber Corp., a beach ball; Atlas Sponge Rubber Co., shoe sponges; Molded Rubber Specialties Co., a soap dish; Kirkhill Rubber Co., a bath mat; Sierra Rubber Co., a steering wheel cover; and A. Schrader's Son, a tire gage. Mr. Drew then introduced George C. Groman, known as the Diplomat of Dialects, who explained the origin of dialects and illustrated various modes with imitations.

L. F. McDonald, of The B. F. Goodrich Co., was the winner of a Univex Candid Camera which was donated by the New Jersey Zinc Co. through the courtesy of its local representative, Arthur E. Wolfe. Ten door prizes consisting of beautiful Horse Head Zinc ash trays, also donated by the New Jersey Zinc Co., were awarded, as a result of the drawing from the return reservation post cards, to R. L. Vignolo, M. Montgomery, T. W. Robertson, Jerome Desser, Charles Parrish, Roy Hillebert, Ed. Sweitzer, Wm. Haney, Paul E. Mekeal, and W. E. Shawger.

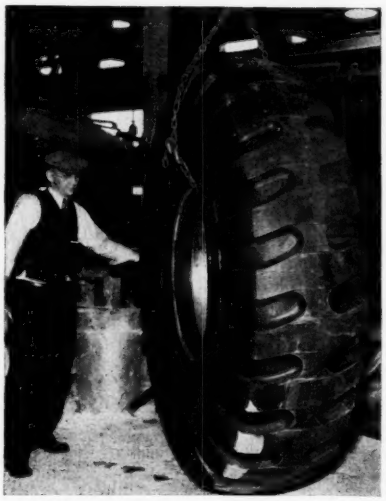
New York Group

AT THE meeting on March 17 of the New York Group, Rubber Division, A.C.S., at which 186 were in attendance, wide approval was given to the new arrangements whereby the technical program was presented at a special session at 4.30 p.m. and the dinner at 7 o'clock was followed by light entertainment. Many complimentary remarks were heard during the evening which indicated appreciation by the members of three main advantages: first, those attending the technical session gave evidence of real interest in the subject matter of the papers, thus encouraging the speakers in their efforts to present helpful information; second, greater opportunity was given after the dinner for renewing old acquaintances and exchanging greetings in a social manner; and third, those living at distant points were able to leave at an early hour without missing the full objectives of their attendance. As a result of segregating the informative and social phases of the meeting there was complete absence of confusion, and ample opportunity existed for discussion of the papers after presentation. In general the new arrangement was regarded as being very successful.

The first speaker introduced by Chairman Nellen was Jacobus F. Frank, representative of the Netherlands East Indies Government Plantation which produces gutta percha. After discussing the uses of gutta percha and the history of the formation and development of the government owned Tjipiter estates, Mr. Frank presented a moving

(*Continued on page 78*)

New Machines and Appliances



Giant Earth Mover Tire Made in Huge Bridgwater Mold

Huge Mold for 34-Ply Tire

ONE of the largest tire molds so far produced was completed recently by the Bridgwater Machine Co., Akron, O., for the Gillette Rubber Co., Eau Claire, Wis.

The mold which was built for a 24.00-32 34-ply Earth Mover tire, has a cavity cross-section of approximately 24 inches and a cavity diameter of 84 inches. It is of the pot heater type and is constructed with cast steel backs into which cast aluminum tread rings are inserted. The total weight is 16,000 pounds. A special combination airbag and tube mold with interchangeable rings and weighing 12,000 pounds was also supplied.

The weight of the tire casing, shown in the accompanying illustration, is 1,448 pounds. One tread requires two batches of tread stock mixed in a number 11 Banbury.

Siemens Super-Microscope

AN electron microscope, recently perfected by Siemens & Halske, A.G., will produce images with a magnification of 30,000 which are so sharp that they can be further enlarged three to four times by optical means. As indicated by the name, in the Siemens electron miscrope the medium of picturing is electron rays which are emitted from an electron tube at a potential of 60,000 to 100,000 volts, then pass through and around the object placed on a very thin collodion film and finally throw the amplified image upon a fluorescent screen for observation, or on a photographic plate. "Focusing" is done by various electromagnetic coils which act like the glass lenses in the light microscope. A number of accessories such as vacuum pumps, voltage and current stabilizing equipment and high-potential supply apparatus are necessary for the operation of the microscope. The magnified images are observed through windows in the side of the microscope. The size of this instrument is indicated in comparison with the men in the photograph. By this super-microscope the form and structure of particles of rubber, ore, dust, paint, metals, etc., of bacteria and viruses, are now laid open for further research.

Electron Microscope

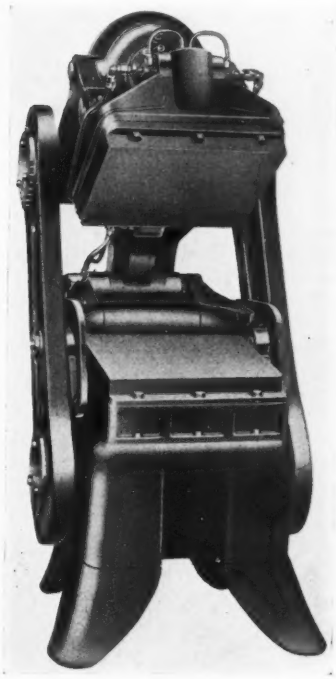
Combination Toggle and Hydraulic Press

TOGGLE presses built in accordance with Colin Macbeth's British patents are being marketed for the molding of general rubber products and plastics. The illustration herewith shows such a type of press having platens of 24 by 27 size. Operating at 300 pounds hydraulic pressure, having a mechanical advantage of 45-1, the press converts a ram pressure of 11 tons into a pressure on the mold of 300 tons after making a very generous allowance for friction.

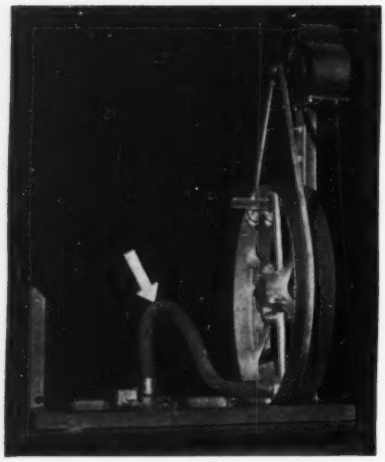
The press illustrated provides about four-inch vertical travel of the top platen in a position parallel to the bottom platen, after which position the top platen tilts to approximately the 45-degree position where both top and bottom mold are unobstructed by any pillars at the front. During the curing period in the closed position the hydraulic supply can be and is regularly turned off, thus economizing in power usage and extending the life of the packings, for they are subject to internal pressure only during opening and closing and when in the open position. The press is self contained and does not need anchorage to a foundation or the floor. Rogers, Wilson & Co., Ltd.

Hose Flexing Machine

THE machine illustrated was designed to duplicate in the laboratory the extremes of service that a piece of fuel oil hose would experience in the field by accelerated stretching, jerking, and twisting while containing the distillate under pressure. The wheel is 24 inches in diameter and revolves at 110 r.p.m. The procedure follows: couple one end of a 30-inch section of the hose with a blind coupling, the shank of which acts as the male part of the swivel; fill with distillate oil; couple other end of hose to air valve; apply 75 pounds air pressure; keep hose in flexed position 12 hours before test-



Macbeth Toggle Press, Front View



Testing a Section of Standard Distillate Hose 30 Inches Long

ing; start machine; and record the number of flexings required to produce failure. Any break in the hose will be readily apparent from seepage because the air pressure will force the oil through the smallest opening. This machine is available commercially, or details can be obtained for local construction by applying to The Dispenser Co.

Washing Machine for Rubber Parts

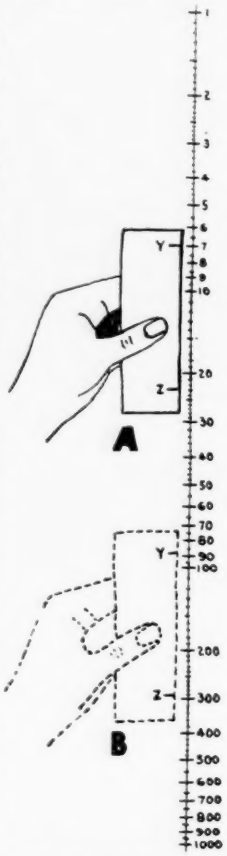
A NEW method of acid-washing golf balls, rubber balls, smaller rubber parts, etc., is being accomplished in the tumbler type of mixer ordinarily used for mixing dry or liquid solutions. With an acid-proof stoneware barrel and leak-proof lid, the machine illustrated is supplied with marked capacities of 10, 15, 20, and 25 gallons and will mix up to 75 to 80% of the marked capacity. The bottom outlet is normally fitted with a rubber plug although ground-in chemical stoneware plugs may be obtained at extra cost. The self-contained 25-gallon size requires floor space 31 by 30 inches, is 31 inches in height, and when equipped with a ⅓-h.p. motor, has a shipping weight of 310 pounds. The United States Stoneware Co.

Electric Tumbelmixer

Pulley Ratio Computer

HERE is a simple and handy computer that does away with formulas and pencil figuring for solving any ordinary problem that involves ratios. It is applicable to a surprisingly wide variety of situations.

The size of two pulleys or sheaves to be used in a drive can be quickly determined: if you want one shaft of a given drive to run at 88 r.p.m., and the other shaft to run at 290 r.p.m., make marks Y and Z on the slip of paper in position "B" opposite the 88 and 290, as indicated. Then move the slip of paper upward or downward and get any combination of diameters you want. The ratio will always be 88 to 290. Thus if you happen to have a 7-inch pulley which you think would be suitable for the 290 r.p.m. shaft, bring the Y mark opposite the 7 as in position "A." The Z mark then indicates that the other pulley must be 23 inches in diameter. If these diameters are considered too small, move the paper downward on the scale until more suitable diameters are obtained.

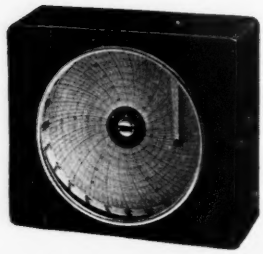


Handy and Simple Computer for Figuring Ratios

The chart also lends itself readily to the solution of such a problem as, knowing the pulley diameters and knowing the speed of one of the pulleys, what is the speed of the other pulley?

Also, you can add ciphers to the figures on the scale where necessary. Just add them mentally as you go along. Thus if in the above example the speeds were 880 and 2900 r.p.m. position "B" applies in exactly the same way and you would get 7 inches and 23 inches respectively in position "A." If you add a cipher to one you must also add a cipher to the other.

This computer is equally applicable to V-belt drives by using the "pitch diameters" of the sheaves. In computing V-belts do *not* base your figures on the outside diameters of the sheaves.



Marsh Self-Contained Thermometer

"Serviceman" Recording Thermometer

SMALL and weighing less than two pounds, the No. 70 "Serviceman" temperature recorder measures 5 by 6 by 2¼ inches. A bi-metallic spiral is used, and zero adjustment is made by a screw. The chart is rotated by a fully adjustable clock movement. An outstanding feature is the pen arm, which has a friction hinge that permits free access for chart replacement. A pointer on the dial enables the operator to set the chart at the proper time. The case is made of cast-aluminum. Jas. P. Marsh Corp.

New Tire Valves

CAPLESS, yet so designed that neither dirt nor water can enter, is this recently introduced tire valve. This valve has no replaceable parts; the internal parts of non-corrosive metal are permanently enclosed in a stem of tough, pliable rubber. The all-rubber design of the stem and base is said to prevent tearing of the tube, with a resultant blow-out, when a normal puncture occurs. It is claimed that this feature promotes tire economy as well as safety. The same capless feature is offered in a valve for truck and bus tires, with the exception that the rubber stem is shorter than that illustrated. Jenkins Bros.

Flexible Capless Tire Valve

New Goods and Specialties

Swimaster—from Swimming Belt to Life Preserver in Six Seconds

Han-Dee Pee-Chee-Wite Kit

Swimaster Life-Saving Belt

SWIMASTER is a life-saving belt that uses the ordinary siphon cartridges available at all drug stores for instant inflation. The belt is made of specially treated fabric bearing eight layers of rubber on the inside, developed by the Hodgman Rubber Co. for the McCord Co., Inc. A slight squeeze of the belt buckle inflates the Swimaster to a buoyancy more than sufficient to float the heaviest person from 12 to 16 hours. According to the inventor, G. J. Peterson, the device is fool-proof and guaranteed to work. Outstanding feature of the belt is that it can be used over and over again simply by inserting fresh cartridges.

New Instant Soling

A NEW material, Instant Rubber Soling, has been developed that will enable shoe repairmen to retread as well as repair rubber footwear. The material is used only for the bottoms of the overshoe, and while it comes to the edge, it is not rolled up around the edge. It is suggested that the best appearing job is secured by buffing off the entire half sole and putting on a complete new one. No special tools are used other than those already in the average shoe repair shop. Seiberling Rubber Co.

Rubber in Shoe Kit

RUBBER sponges are now used by the Pee-Chee Cleaner Mfg. Co. as part of its new Han-Dee Pee-Chee-Wite Shoe Cleaning Kit. The cleaner, formerly sold alone, has gained sales appeal by being offered as part of a complete shoe cleaning kit with two rubber sponges, one for removing the dirt from shoes and the other for applying the cleaner. The kit is packaged in an attractive red and black folding carton designed and manufactured by the Robert Gair Co.

Rubber Paint Protects Latex against Contamination

A MAJOR problem faced by manufacturers who process rubber products direct from latex is to protect the latter from contamination and discoloration during shipment and handling. The main difficulty lies in the fact that it is necessary to mix a certain amount of ammonia in the latex to preserve it, for when the ammonia comes in contact with metal, a chemical reaction results which causes serious contamination and discoloration of the latex.

A practical solution to this problem is now offered by The B. F. Goodrich Co., Akron, O., which has developed a paint known as Acidseal, which, unlike ordinary paints, contains a special rubber isomer instead of the usual oil or resin. Acidseal is said to eliminate any action of ammonia on metal and, when applied to the interior surface of tank cars, storage tanks, and pipe lines, assures complete protection for the latex.

This special Acidseal paint is performing a similar service also in many other industries. It is widely used by suppliers of caustic liquor to the rayon industry who must deliver a product absolutely free from any discoloration or contamination. Besides makers of costly dyes are painting the interior of their shipping drums with this same Acidseal paint as a protective measure. Acidseal paint is also generally applicable as a protection against the action of corrosive fumes.

YKL SS Heat-proof Truck Tire

New Goodyear Tire

THE Goodyear Tire & Rubber Co. recently announced a new truck tire, YKL SS, made in four sizes for trucks, tractors, and trailers of 2½ tons or over. Features include: carcass of Rayotwist, the especially woven rayon fabric claimed to resist heat; an extra-thick tread, said to average 50% thicker than ordinary treads; a new principle of "multiple" compounding to give greater adhesion between tread and carcass; and wide riding ribs to assist in slow, even, more uniform wear.

Rubber Industry in America

FINANCIAL

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., and subsidiaries. For 1938: net income, $2,452,912, including equity in undistributed net income of associated companies, and after deductions for depreciation, depletion, interest, federal income taxes, subsidiary preferred dividends, and other charges. After dividends on the 5% preferred stock, the result is equal to 91¢ each on the combined 2,618,359 shares of $10 par Class A and Class B common stocks, excluding 59,674 shares of Class B in the treasury. Including the equity in undistributed net income of associated companies, the net profit for the year was $2,787,172, or $1.04 a share on the combined A and B common stocks. Net profit in 1937 totaled $5,268,255, excluding the equity in undistributed net income of associated companies, equal to $2.09 a share on the 2,520,368 shares of combined Class A and B common stocks then outstanding. Including the equity in undistributed net income of associated companies, the net was equal to $2.14 a share. Current assets as of December 31, 1938, including $10,945,866 cash and marketable securities were $33,653,471, current liabilities, $5,513,595, against cash and marketable securities of $11,400,094, current assets of $32,999,710 and current liabilities, including $666,000 bank loans, of $6,756,426 at the end of 1937. Inventories were $16,941,302, against $16,684,607.

American Hard Rubber Co., 11 Mercer St., New York, N. Y. For 1938: net profit, $47,555, equal to $2.09 each on 22,682 shares of 8% cumulative preferred stock, against net profit of $381,554, equal to $3.05 each on 65,503 shares of common stock, after preferred dividend requirements, in 1937.

American Wringer Co., Inc., Woonsocket, R. I., and subsidiaries. For 1938: net income, $27,984, equal to 25¢ each on 111,285 shares against net loss of $7,222 in 1937.

American Zinc, Lead & Smelting Co., Columbus, O., and subsidiaries. December quarter: net profits, $22,600, equal to 34¢ each on 66,553 shares of $5 prior preferred stock, against net loss of $24,235 in the preceding quarter and $108,322 loss after $207,604 inventory write-down in the December quarter of 1937.

Armstrong Cork Co., Lancaster, Pa. For 1938: net income $1,150,796, after federal taxes and other charges, equal to 77¢ a share on 1,409,544 common shares after preferred dividend requirements, contrasted with 1937 net income of $5,157,887, or $3.66 a share on the 1,410,644 common shares. Net profit of domestic companies of $992,015 for 1938 compared with $4,855,852 in 1937. Foreign companies, excluding the Spanish subsidiary for both years showed a profit of $158,781, against one of $302,035 in 1937. Domestic sales in 1938 totaled $37,297,363, including sales of several new businesses acquired during the year. Excluding sales of these new businesses, the domestic sales were $34,831,512, or 18.5% less than the 1937 volume of $42,795,445. Sales of subsidiaries operating in Great Britain, the Dominion of Canada, France and North Africa amounted to $2,210,301, against $2,953,289.

Belden Mfg. Co., 4647 Van Buren St., Chicago, Ill. For 1938: net loss, $101,711, against net income of $393,265, equal to $1.65 each on 241,547 capital shares in 1937.

Canada Wire & Cable Co., Ltd., Leaside, Ont., Canada, and subsidiaries. For 1938: net profit, $462,655, equal after dividend requirements on 28,741 shares of 6½% cumulative preferred stock and on 29,669 shares of $4 cumulative preferred Class A stock, to $1.04 each on 150,662 shares of Class B common stock, contrasted with 1937 net profit of $794,252, equal after preferred and Class A dividend requirements to $3.23 a share on Class B common stock.

Columbian Carbon Co., 41 E. 42nd St., New York, N. Y. For 1938: net earnings, $2,757,539, or $5.13 each on the 537,406 no-par capital shares outstanding, against $4,466,249, or $8.31 a share in 1937. On December 31, 1938, consolidated current assets, including cash and marketable securities of $3,221,885, amounted to $6,219,419, against current liabilities of $1,047,019. At the end of 1937 current assets, including cash and marketable securities of $3,164,438, totaled $6,072,319, and current liabilities $1,513,310.

Corduroy Rubber Co., Grand Rapids, Mich. For 1938: net income, $195,025, equal after dividend requirements on preferred stocks to $2.83 each on 28,469 shares of common, against $118,821, or 91¢ a share, on 29,395 common shares in 1937.

Dewey & Almy Chemical Co., Cambridge, Mass. For 1938: consolidated net profit after obsolescence, but before $25,242 non-recurring charge against prior years' operations, was $270,063, equal to 82¢ each on 191,775 outstanding shares of combined common and Class B common stock, after annual dividend requirements of $112,470 on the $5 convertible preferred. These earnings compared with a consolidated net profit in 1927 of $402,482, equal to $1.35 each on 181,032 shares of combined stock then outstanding, after dividends of $157,811 on the former prior preference and preferred stocks. These issues were eliminated through an exchange of stocks in December.

Dunlop Rubber Co., Ltd., Fort Dunlop, Birmingham, England. For 1938: Net profit, £1,501,000, against net profit in 1937 of £1,591,000.

Fisk Rubber Corp., Chicopee Falls, Mass., and subsidiaries. For 1938: consolidated net profit, $673,001, after provision for federal taxes and all other charges, equivalent to $1.05 a share on the common stock, compared with a net profit of $332,751 in 1937. Net sales for 1938 totaled $16,013,551, against $17,607,429 in 1937. Current assets on December 31, 1938, were $10,264,460; current liabilities, $991,309. Working capital at the year end amounted to $9,273,151, including $2,731,979 cash, against $8,821,822 and $639,359, respectively, on December 31, 1937.

General Cable Corp., 420 Lexington Ave., New York, N. Y. For 1938: net loss, $893,714, against net profit in 1937 of $1,232,937, after raw material loss of $2,429,150, equal to 51¢ each on 359,003 shares of $4 Class A stock after dividend requirements on 7% preferred. Current assets as of December 31, 1938, including $1,458,926 cash, totaled $10,691,537, and current liabilities, including $1,250,000 of bank notes payable, $3,492,522, compared with cash of $2,180,296, current assets of $14,205,600, and current liabilities of $6,468,509 at the end of the preceding year. Inventories were reduced $2,068,482 during 1938, standing at $7,608,905 at the close of 1937.

General Electric Co., Schenectady, N. Y. For 1938: net income, after provision for all charges, $27,729,000, equal to 96¢ a share, against $2.21 a share in

1937; provision for total 1938 taxes, $15,632,000, compared with $23,266,000 in 1937; current assets, $182,767,000; current liabilities, $27,744,000; cash and marketable securities, $98,715,000, against $47,536,000 a year ago; current receivables from customers, after reserve, $19,780,000, against $19,095,000; in 1937; inventories, after reserves, $68,518,000, against $93,768,000 the end of the preceding year; sales billed, $259,484,000, against $349,740,000 for 1937; orders received, $252,176,000, against $379,274,000 in 1937; capital expenditures for plant and equipment, $12,000,000, against $20,600,000 in 1937; general reserve, $19,780,000, against $19,095,000; earned surplus at the end of 1938, $122,671,000, against $121,457,000. The company has no funded debt or notes payable outstanding, and there were no loans to officers or directors.

Orders received during the first two months of 1939 amounted to $51,800,000, against $41,300,000 in the same period last year.

Garlock Packing Co., Palmyra, N. Y. For 1938: Net profit, $544,482, equal to $2.60 each on 209,250 shares of common stock outstanding, against $1,138,778, or $5.44 a common share in 1937. Business is running 15% aheadof last year.

L. H. Gilmer Co., Tacony, Philadelphia, Pa. For 1938: net sales, $1,049,964, against $1,326,862 in 1937; and net profit, $60,133, against net profit of $112,268 the year before.

B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont. (Controlled by B. F. Goodrich Co., Akron, O.) For 1938: net loss before income bond interest $237,318, against $136,217 loss on same basis in 1937.

Jenkins Brothers, Inc., Bridgeport, Conn. For 1938: net income after undistributed profits tax, $127,799, equal, after dividend of 7% on preferred stock, to 67¢ each on 126,712 common shares, against $249,086, or $1.62½ a share, in 1937.

Martin Custom Made Tires Corp., 645 Eleventh Ave., New York, N. Y. February 15, 1938, to December 31: net loss, $1,034; total sales, $715,585.

Master Tire & Rubber Corp., Akron, O., and subsidiaries. For 1938: net income, $135,178, equal to 53¢ each on 89,225 common shares after preferred dividend requirements, against net loss of $116,221 in 1937. Net sales for 1938 were $3,132,538, against $2,326,800 in 1937. Current assets on December 31, 1938, were $715,528; current liabilities, $376,310; against $507,846 and $342,615 respectively the end of 1937.

National Rubber Machinery Co., Akron, O. For 1938: profit from operations, $69,560, before non-operating and non-recurring charges. After deducting expenses on plants not in production, less rentals received, $17,509 advances to and investment in Jackomatic Corp. charged off and loss on other investments, there was a net income for 1938 of $47,062, equal to 30¢ each on 154,000 capital shares. In 1937 the company showed a net loss of $94,400 after non-operating and non-recurring charges.

Seiberling Rubber Co. of Canada, Ltd., Toronto, Ont., Canada. Year ended October 31, 1938: net profit, $15,100, against $2,681 in the preceding year. Gross profit was $344,357, against $329,550. Current assets were $641,857; current liabilities, $903,016.

Skelly Oil Co., 4814 S. Richmond St., Chicago, Ill. For 1938: net income, $2,650,054 after charges, taxes, and reserves for depreciation and depletion, equal, after dividend requirements on the preferred stock, to $2.27 each on the 995,349 common shares. This compares with $6,488,346, or $6.07 a common share, in 1937. Gross earnings from operations were $35,880,450, against $41,483,607. The balance sheet for December 31, 1938, shows current assets of $12,280,998, and current liabilities, $4,722,091, against $12,241,621 and $4,418,513, respectively, on December 31, 1937. Cash was $4,377,656, against $3,453,141. Consolidated earned surplus account totaled $11,432,065, against $8,020,729.

A. G. Spalding & Bros., 105 Nassau St., New York, N. Y. Quarter ended January 31: net loss $108,284, against net loss of $287,473 in the corresponding quarter last year.

Thermoid Co., Trenton, N. J., and domestic subsidiaries. For 1938: net income, $19,952 after amortization and minority interest, equal to 50¢ each on 39,956 shares of $3 convertible preferred stock, excluding 364 treasury shares. Net income in 1937 was $120,676, equal, after preferred dividend requirements, to less than 1¢ each on the 476,388 shares of common stock.

United States Rubber Co., 1790 Broadway, New York, N. Y., and subsidiary companies. For 1938: net income, $5,885,888 after all charges, including inventory adjustments of $1,792,082, and after deducting net income applicable to minority interests in subsidiaries. The income is equivalent to $9.02 a share on the 651,091 shares of non-cumulative preferred stock of $100 par, on which a dividend of $4 was paid last year. After deducting the full 8% dividend requirements thereon, the net income is equal to 44¢ each on the 1,536,101 shares of common stock.

For 1937 the net income was $8,607,903, or $13.22 a preferred share and $2.21 a share on the common, after allowing for preferred dividend requirements.

Current assets on December 31, 1938, totaled $89,939,698; current liabilities, $23,262,486; against $98,056,144 and $30,925,759, respectively, the preceding year. Cash rose to $16,574,581 from $11,886,293 a year earlier. Inventories of $50,167,266 were reduced from $63,936,251 on December 31, 1937. Outstanding funded indebtedness at the close of 1938 was $44,950,000, a reduction of $6,050,000 from 1937.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Collyer Insulated Wire Co.	Com.	$0.10	Apr. 1	Mar. 25
Detroit Gasket & Mfg. Co.	Com.	$0.25	Apr. 20	Apr. 5
Dominion Textile Co.	Com.	$1.25 q.	Apr. 1	Mar. 15
Dominion Textile Co.	Pfd.	$1.75 q.	Apr. 15	Mar. 31
Dunlop Rubber Co., Ltd., adr.	Com.	8% final	Apr. 22	Mar. 23
Firestone Tire & Rubber Co.	Com.	$0.25	Apr. 20	Apr. 5
Garlock Packing Co.	Com.	$0.50	Mar. 31	Mar. 25
General Electric Co.	Com.	$0.25 q.	Apr. 25	Mar. 17
B. F. Goodrich Co.	$5 cum. Pfd.	$1.25 accum.	Mar. 31	Mar. 24
B. F. Goodrich Co.	Pfd.	$1.25 q.	Mar. 31	Mar. 24
Hewitt Rubber Co.	Com.	$0.10	Mar. 15	Mar. 2
Jenkins Bros.	Com.	$1.75 q.	Mar. 31	Mar. 16
I. B. Kleinert Rubber Co.	Com.	$0.10	Mar. 31	Mar. 15
Midwest Rubber Reclaiming Co.	$4 Pfd.	$1.00 q.	Mar. 1	Feb. 17
Pharis Tire & Rubber Co.	Com.	$0.15	Mar. 20	Mar. 4
Thermoid Co.	$3 Pfd.	$0.40 accum.	Mar. 15	Mar. 2
United States Rubber Co.	Com.	$2.00 q.	Mar. 24	Mar. 10
United States Rubber Co.	Com.	$2.00 q.	June 23	June 9
United States Rubber Co.	8% non-cum. 1st Pfd.	$2.00 q.	Mar. 24	Mar. 10
United States Rubber Co.	8% non-cum. 1st Pfd.	$2.00 q.	June 23	June 9

United States Latex Imports

Year	Pounds (d.r.c.)	Value
1936	44,469,504	$6,659,899
1937	51,934,040	10,213,670
1938	26,606,048	4,147,318
1939		
Jan.	3,589,452	599,927

Data from Leather and Rubber Division, United States Department of Commerce, Washington, D. C.

Rubber and Canvas Footwear Production Statistics

Thousands of Pairs

	Inventory	Production	Shipments
1936	13,615	70,831	71,915
1937	20,430	74,102	67,191
1938	16,183	50,812	54,942
1939			
Jan.	16,157	4,807	4,778

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

EASTERN AND SOUTHERN

BUSINESS activity has been steady at somewhat lower levels, but the usual spring pick-up is expected soon, to extend well into the second quarter. Points indicating such an upturn, cited by one authority, include the government's new attitude toward business, more favorable seasonal factors, improving industrial demand, rising consumer buying power, low inventories, the declining trend in foreclosures, the well-balanced condition in various industries; the general lack of over-optimism; and the possibility of some strengthening in agricultural prices following drastic control programs for 1939.

The building trade, particularly, expects a 20% gain over last year, most of which, however, seems slated for the first half of 1939. Steel output has been fluctuating slightly, with production last month at about 56% of capacity. Shoe factories have been operating well above a year ago to complete deliveries delayed several weeks because of a shortage in certain types of leather; but retail sales have failed to keep pace with production, and inventories are accumulating. The Tanners' Council of America recently reported that rubber and composition soles accounted for about 25% of all soles used in the last half of 1938, a new high record. Last month machine tool orders reached the highest point since September, 1937, with the gains recorded for domestic use as foreign orders have remained at about the same levels for the last six months.

Waterproof Footwear Stocks Reduced

A recent survey of both manufacturers and distributers discloses that stocks of waterproof footwear have been greatly reduced as a result of the heavy snow and wet weather experienced during the past winter. Manufacturers' stocks have declined by about three million pairs during the past twelve months. As for stocks of wholesalers and retailers, careful checks in all parts of the country indicate conclusively that they are much lower than they have been for many years. Reports from several trade centers indicate that many retailers were unable to supply the rubber footwear needed as a result of the mid-month storm.

The widely-known shortage of distributers' stocks, plus the sharp decline in manufacturers' inventories, indicates the probability of a tight delivery situation for 1939-1940.

Franklin Rubber Co., Philadelphia, Pa., according to Max Durst, president, has increased its working force.

The United States Federal Government, Washington, D. C., on February 20 filed suit in the Federal District Court for the Southern District of New York for $1,053,474.63 damages against 18 leading tire manufacturers as a result of Assistant Attorney General Thurman Arnold's monopoly investigation. The complaint charges a conspiracy to fix the price of tires on sales to the government, in alleged violation of the Sherman Anti-Trust Act. Defendants named in the suit are: Cooper Corp., Findlay, O.; Dayton Rubber Mfg. Co., Dayton, O.; Dunlop Tire & Rubber Corp., Buffalo, N. Y.; Falls Tire & Rubber Co., Findlay; Firestone Tire & Rubber Co., Akron, O.; Fisk Rubber Corp., Chicopee Falls, Mass.; General Tire & Rubber Co., The B. F. Goodrich Co., and Goodyear Tire & Rubber Co., all of Akron; Kelly-Springfield Tire Co., Cumberland, Md.; Lee Tire & Rubber Co., Conshohocken, Pa.; Mohawk Rubber Co., Akron; Norwalk Tire & Rubber Co., Norwalk, Conn.; Pennsylvania Rubber Co. of America, Inc., Jeannette, Pa.; F. G. Schenuit Rubber Co., 1200 Mt. Royal Ave., Baltimore, Md.; Seiberling Rubber Co., Akron; and United States Rubber Products, Inc., and United States Tire Dealers Corp., both of 1790 Broadway, New York, N. Y.

The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., announced that at a meeting on February 28 J. W. Hodgson, Firestone Tire & Rubber Co., and J. J. Singleton, Mohawk Rubber Co., both of Akron, O., were elected chairman and vice chairman, respectively, of the Tire Accessories and Repair Materials Committee of the association.

Robert Badenhop Corp., crude rubber importer, last month moved to larger quarters on the twenty-second floor of the Woolworth Bldg., 233 Broadway, New York, N. Y. Officers of the company include: president, Robert Badenhop; vice president, G. LeRoy Scheinler; treasurer, Murray Millenthal; secretary, James F. Kiernan; and assistant secretary, Robert A. Badenhop, who recently joined the firm after a tour of the crude rubber producing countries in the Far East.

Vulcanized Rubber Co., Morrisville, Pa., reports business is picking up, with new orders on hand. The company recently recalled a number of old employes.

Hohwieler Rubber Co., Morrisville, Pa., is busy filling orders for sporting goods for the spring trade. President William Hohwieler said: "We find that business has taken an upward turn of late and have received a number of orders. We believe this to be an indication of a good summer trade."

National Association of Manufacturers, 19 W. 49th St., New York, N. Y., recently appointed chairmen and vice chairmen of the committees to shape its policy for 1939. Among those named are: committee on educational cooperation, chairman, H. W. Prentis, Jr., president, Armstrong Cork Co., Lancaster, Pa.; committee on employment relations, vice chairmen, L. N. Bent, vice president, Hercules Powder Co., Wilmington, Del., C. S. Craigmile, vice president, Belden Mfg. Co., Chicago, Ill., and Col. Charles E. Speaks, president, Fisk Rubber Corp., Chicopee Falls, Mass.; committee on government finance, vice chairman, F. E. Schluter, president, Thermoid Co., Trenton, N. J.; committee on national defense and industrial mobilization, chairman, A. W. Robertson, chairman, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; committee on patents and trade marks, vice chairman, Walter Robbins, chairman, General Cable Corp., New York; committee on public relations, vice chairman, Paul Garrett, director of public relations, General Motors Corp., New York; committee on study of depression, vice chairman, E. V. O'Daniel, vice president, American Cyanamid Co., New York; committee on tariff, chairman, Howard T. Young, president, American Zinc, Lead & Smelting Co., St. Louis, Mo.

Pennsylvania Rubber Co., Inc., Jeannette, Pa., through J. Frank Moore, assistant sales manager, has announced the appointment of C. P. Werner as manager of the Philadelphia, Pa., branch. He was formerly district credit manager in the eastern sales zone, including the New York, Boston, and Philadelphia branches.

Polish Rubber Manufacturer Visits U. S.

On March 24, David Schrage, president of the Gentleman Rubber Co., of Lodz, Poland, sailed from New York on the *Queen Mary* after spending two months in this country visiting American rubber goods manufacturers and machinery suppliers. The Gentleman Rubber Co., which is the largest manufacturer of rubber goods in Poland, comprehensively covers the field of rubber products including footwear, mechanical goods, tires, sponge rubber, thread, etc.

United States Department of Labor, Washington, D. C., recently announced awarding several supply contracts, including: Titanium Pigment Corp., 111 Broadway, New York, N. Y., for Norfolk, Va., Navy Yard, titanium-barium, $25,825; Lite Mfg. Co., 624 Broadway, New York, Marine Corps, rubberized

Guests at the Testimonial Dinner for "Jerry" Shaw

ponchos, $46,687; Okonite Co., Passaic, N. J., for Philadelphia, Pa., Navy Yard, cable, $11,299.

"Jerry" Shaw Honored

The Greater New York Tire & Battery Association, 150 Nassau St., New York, N. Y., on March 8 at the Hotel Park Central, New York, gave a testimonial dinner for Jerome T. Shaw, editor of *Tires*, in recognition of his services to the organization, which was founded 19 years ago largely through his efforts and in which he has been very active ever since, holding the position of secretary most of the time. More than 200 members and friends took part in the festivities, with George J. Erlinger, past president of the National Association of Independent Tire Dealers, Inc., 250 W. 57th St., New York, who was also chairman of the dinner committee, a most capable toastmaster.

Among the speakers was Harry D. Nelson, president of the New York association, who presented Mr. Shaw with an inscribed wrist watch as a tribute to his activities in the organization's work. Other speakers included Louis A. Brown, counsel for the association and a tire dealer for three decades; Louis K. Beller, another veteran dealer and a former national association director; and Edward Lyman Bill, president of Bill Brothers Publishing Corp., 420 Lexington Ave., publisher of INDIA RUBBER WORLD and *Tires*.

Dealers present were from the Metropolitan area and represented Kelly-Springfield, Goodrich, Serber Rubber, Goodyear, Fisk, Norwalk, Lee, U. S. Rubber, General, Star, Martin, Public Service, Schrader, and Wheels, Inc. Also attending were many manufacturers' district and branch managers besides company executives, as J. W. Whitehead, president, and A. A. Hall, manager of battery and accessories sales, Norwalk Tire & Rubber Co., Norwalk, Conn.; James Martin, president, and George A. Dorman, general manager, Martin Custom Made Tire Corp., New York; A. Koehler, vice president, Vogue Rubber Co., Chicago, Ill.; Otto Kretchmar, president, Imperial Mfg. Co., Newark, N. J.; Edward Stanton, eastern representative, Safety Vulcanizer Co., Chicago; Emmet Pollard, vice president, Trutred, Inc., Los Angeles, Calif.; D. W. Johnston, accessories sales manager, W. T. Johnston, sales representative, Metropolitan District, Del F. Sisney and Bruce Bowlby, advertising department, A. Schrader's Son, Brooklyn, N. Y.; W. L. Finger, chairman of the tire manufacturers' division, Rubber Manufacturers Association, Inc., 444 Madison Ave., New York; George J. Burger, Jr., manager of the retreading-recapping department, N. A. I. T. D.; and S. C. Stillwagon, editor, INDIA RUBBER WORLD.

Moore & Munger, broker of petroleum waxes and producer and marketer of clays for use in the manufacture of paper, rubber, and other products, 33 Rector St., New York, N. Y., has announced that L. Gordon Campbell, manager of the lubricating bulk sales department of Standard Oil Co. of Indiana at Chicago, Ill., on April 1 will join its staff. With Standard, Mr. Campbell directed the sales of lubricating oils, waxes, petrolatums, candles, white oils, and related products to jobbers and oil companies.

Hercules Powder Co., Wilmington, Del., on March 22 held a directors meeting at which Charles A. Higgins, with the company since 1915 and vice chairman of the executive committee since 1933, was elected president, succeeding R. H. Dunham, who remains chairman of the board, the position he held jointly with the presidency since the organization of Hercules Powder in 1912. Mr. Dunham also will serve as chairman of the finance committee. Directors were reelected at the annual meeting of stockholders.

Southern Textile Exposition will be held at Textile Hall, Greenville, S. C., April 3 to 8. Included among the exhibitors are: American Cyanamid & Chemical Co., 30 Rockefeller Plaza, New York, N. Y.; Armstrong Cork Products Co., Lancaster, Pa.; Bristol Co., Waterbury, Conn.; H. W. Butterworth & Sons Co., Philadelphia, Pa.; Dayton Rubber Mfg. Co., Dayton, O.; Denman Tire & Rubber Co., Warren, O.; E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; Gates Rubber Co., Denver, Colo.; General Electric Co., Schenectady, N. Y.; L. H. Gilmer, Tacony, Philadelphia; Hercules Powder Co., Wilmington; Hope Webbing Co., Providence, R. I.; Jenkins Bros., 80 White St., New York; Taylor Instrument Cos., Rochester, N. Y., and Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

U. S. Rubber Co.

United States Rubber Co., 1790 Broadway, New York, N. Y., will hold its forty-seventh annual meeting of stockholders on April 18 at 15 Exchange Pl., Jersey City, N. J., to fix the number of and to elect a board of directors and to transact any other necessary business.

Safety Contest

The company, according to E. W. Beck, supervisor of safety, has conducted a safety contest throughout its vast organization for the past 15 years, and during this time the accident frequency and severity rates have consistently improved with the result that the year 1938 showed the best rates on record.

Winners of last year's contest, as announced by President F. B. Davis, Jr., follow: Larger Plants: President's Prize of $300, Indianapolis, Ind., plant; second prize of $150, Samson plant, Los Angeles, Calif.; third prize of $75, Passaic, N. J., plant; Smaller Plants: President's Prize of $100, Development Division, Passaic, N. J.; second prize of $75, Naugatuck (Conn.) Chemical plant; third prize of $50, Shelbyville (Tenn.) Mills. Each of these six factories has shown an improvement of more than 55% over the average of their previous three years' experience; all but one plant are repeat winners. The Development Division went through 1938 without a compensable

(*Continued on page 78*)

OHIO

CONDITIONS appear to be improving for the rubber industry. Makers of rubber machinery and molds in Akron territory report good business, and the recently announced increase in tire prices should also benefit manufacturers. Companies catering to the automotive industry also are in a stronger position than a year ago. It is felt that 1939 should be a good year for the rubber industry. Besides the demand for rubber products, including original equipment tires, by the automobile industry, which anticipates a good year also, increased replacement tire sales are expected in view of peak car registrations and more liberal consumer spending. Any increase, also, in industrial production should result in greater call for mechanical rubber goods.

Goodyear Activities

Goodyear Zeppelin Corp., Akron, in response to calls for bids after more than ten years by the United States Navy for construction of a rigid airship of 1,000,000 cubic feet capacity and not more than 325 feet in length, to be completed and ready for flight in 24 months, submitted four bids involving ships of different designs and varying in capacity from 800,000 to 3,000,000 cubic feet volume. These were the only bids received.

New Department

Goodyear Tire & Rubber Co. recently formed a new department, General Merchandise Control, to include all shipping and warehousing as well as the Traffic and Merchandise Distribution departments. The aim of the new department is to secure coordinated action of all departments concerned with the movement and storage of goods so that a more rapid turnover and distribution of products between factory and ultimate consumer may result. Manager will be W. H. Fleming, responsible to E. J. Thomas, executive vice president. Mr. Fleming is succeeded in his former post, superintendent of the California plant, by F. A. Steele, general superintendent of the English plant. His successor is H. A. Brittain, formerly in charge of Tech Service in England.

Litchfield Announcements

President Paul Litchfield at the recent Goodyear celebration announced that the company will spend about $3,000,000 in modernizing its three Akron plants. Already many maintenance men have been called back to work to get the program well under way.

Another announcement by President Litchfield was that the Old Guard, as a gift on the fortieth anniversary of their joining Goodyear, will be given a trip to the West this spring to include visits to Litchfield Park, Ariz., and the San Francisco Golden Gate Exposition. This group now consists of Ed Hippensteal, George Swartz, Al Cunnington, Fred Colley, Ed Viers, and Clara Bingham.

Safety Trophy Winner

The Chemical Division, Akron, won the Slusser Safety Cup for 1938 in the annual contest, now in its eleventh year, conducted among the plants of the Goodyear organization. The winning division had only one accident last year, entailing only two days' absence from work. Close behind the winner were the St. Hyacinthe and New Toronto plants.

Off to Brazil

Last month several Goodyear men and their families sailed to Sao Paulo, Brazil, to take up their duties at the newest Goodyear factory. Included were F. J. Carter, superintendent, Don Lamphear and Paul Murphy, division superintendents, Walter Batson, development, and 14 squadron men.

Knife Made under Goodyear Patent

R. C. Woodford, Machine Design, has among his possessions part of a still-serviceable set of silver table knives with gutta percha handles upon which are stamped the words: "Goodyear patent, May 6, 1851." These are part of a wedding gift received by Mr. Woodford's mother when she married in 1856. Charles Goodyear was alive at the time and, although not engaged in manufacturing, had licensed out his patents to other firms.

Tire Prices Raised

Recently the Firestone Tire & Rubber Co., Akron, in a surprise move announced increases in tire prices which dealers said averaged 2½%. The rest of the industry promptly followed suit, including: Dayton Rubber Mfg. Co., Dayton, O.; The General Tire & Rubber Co. and The B. F. Goodrich Co., both of Akron; United States Rubber Co., 1790 Broadway, New York, N. Y.; Pennsylvania Rubber Co. of America, Inc., Jeannette, Pa.; Lee Tire & Rubber Co., Conshohocken, Pa.; Norwalk Tire & Rubber Co., Norwalk, Conn.

These price increases are largely attributed to the rising cost of crude rubber.

A. Schulman Co., Inc., scrap rubber broker, has moved its Akron office from their downtown location to a new, specially constructed building adjacent to the firm's warehouse on Darrow Road, according to President Alex Schulman. This move was made to facilitate handling of orders and to provide better, faster service for customers. The new office building is attractively modern in every detail. The concern, entering its eleventh year of business, also maintains offices in East St. Louis, Ill., and Boston, Mass.

Goodrich News

More than four billion pounds of materials for the manufacture of tires and 32,000 other rubber products by The B. F. Goodrich Co. were moved by 75 tractors and 600 trailers in the company's Akron plant last year, mostly in a series of tunnels under the plant longer than New York's Holland Tunnel. Among the materials handled were: from 10 to 25 carloads of crude rubber, averaging 30 long tons a carload, or a maximum of 1,680,000 pounds daily; two or three carloads of carbon black, maximum total of 195,000 pounds, and approximately 400,000 pounds of pigments, exclusive of carbon black, daily; nearly 400,000 gallons of oil and solvents and about 215,000 pounds of paper, for packing of products and other uses, monthly; and the equivalent of 53,000 bales, or about 22 million pounds, of cotton in the form of weftless tire cord, hose, yarn, and fabrics, and 70 carloads of wire beads for tires annually.

The Goodrich company recently received a contract from the Federal Government for de-icing equipment, to the amount of $50,500.

New Union Contract

Last month Goodrich signed a new labor contract with the United Rubber Workers of America which covers 8,500 employes and is said to provide an increase in some vacation pay schedules and to stipulate a three-day notice of lay-offs. The agreement expires December 31, 1939, but not later than December 1 must negotiations for revision or extension begin. If satisfactory conclusions are not reached by the year-end, this agreement shall continue in effect until cancelled by either party on 30 days' written notice to the other party after December 31, 1939.

World's Fair to Aid Tire Sales

World's Fair travel, according to J. J. Newman, vice president in charge of Goodrich tire sales, is expected by Akron tire manufacturers to increase the 1939-40 tire sales by from 5 to 7%. From estimates by officials of both fairs and reports from the 1,400 Goodrich retail tire dealers 4 million automobiles will cover 16 billion miles above normal vacation mileage, representing 64 billion tire miles. In addition, passenger and test cars within the grounds are expected to add several million car-miles. The ten-car troupe of Goodrich stunt drivers at the New York World's

Fair is expected to cover about 1,100,000 miles during the performances which will be made six times each day.

New York World's Fair officials have designated July 1 as Goodrich Day throughout the great fair grounds. Already the combined Goodrich Ten-Year Service clubs have made arrangements for a trip to New York, to leave Akron on June 30.

Guy Gundaker, manager of accessory sales for Goodrich, was appointed resident manager of the Goodrich World's Fair exhibit and buildings in New York, N. Y., and will transfer his residence from Akron to New York for the duration of the fair. He will be assisted by J. A. White of the Goodrich organization in Boston, Mass., J. R. Clayton, New York, Kenneth Banks, of the Akron mechanical goods division, and Al Hupfer, president of the Goodrich 20-Year Service Club.

Textile Rubber Co., Akron, specializes in molded mechanical rubber goods. Officers follow: J. R. Hollingsworth, president; H. L. Gifford, vice president; and C. M. Keitt, secretary.

Western Reserve Rubber Co., 483 Kenmore Blvd., Akron, manufacturer of balloons and balloon novelties, founded in 1915, now has 65 workers, and for 1938 sales totaled $150,000. A. B. Whitten is company president, and G. E. Hill, secretary-treasurer.

Seiberling Appointments

The Seiberling Rubber Co., Akron, according to Col. J. L. Cochrun, vice president in charge of sales, has appointed as advertising manager N. E. Malone, former sales promotion manager of The Goodyear Tire & Rubber Co., Akron. He succeeds John H. Bunting, now president and general manager of Akron Aircraft, Inc.

H. A. Waite, Seiberling export manager, last month announced the appointment of J. L. Cochrun, Jr., as the company's representative in South America. He was formerly with the Dallas, Tex., branch, where he is succeeded by A. J. Edsell.

Other Seiberling changes follow. R. J. McElhinney, former office manager at Dallas, Kansas City, and Chicago branches, succeeds R. H. Garvin, resigned, as office manager of the Dallas branch. Ross Barton has joined the Kansas City force with headquarters at Omaha, Neb.; while Robert Baker has joined the New York branch.

W. E. "Ed" Palmer, secretary, assistant treasurer, and a director of the Seiberling company, recently completed four decades of service with the Seiberlings. When F. A. and C. W. were influential factors in the newly organized Goodyear Tire & Rubber Co. in 1899, Mr. Palmer joined the company, and when in 1921 the Seiberlings organized their own concern, he went with them.

Anderson Rubber Co., 644 E. Tallmadge Ave., Akron, has been turning out toy balloons since its inception in 1907; employes now number 125. The company, which also makes bladders for athletic goods, is headed by Selden W. Anderson; S. W. Anderson, Jr., is sales manager.

The Pharis Tire & Rubber Co., Newark, according to President Carl Pharis, has let a contract for an addition to the present factory building, aggregating some 21,000 square feet of manufacturing space, two stories, and basement, and the purchase of additional machinery. Construction will start immediately. The addition of this manufacturing space has been made necessary by increased volume of business and for more efficient operation.

Owen Rubber Products Co., 100 Beech St., Akron, which was started in 1935 and now has 20 employes, makes rubber zipper cases, sports bags, stair treads, and matting. Officers include D. A. Jones, president, J. S. Campbell, treasurer, and Alfred Herberich, secretary.

The Perfection Rubber Co., 420 Morgan Ave., Akron, manufacturer of druggists' sundries, was founded in 1910, has about 30 employes, and lists the following officers: president, W. B. Augustine; vice president, R. W. Turnbaugh; and secretary-treasurer, G. W. Monroe.

MIDWEST

THE Midwest, like the rest of the nation, experienced a disappointing drop in business, but hopes are higher for the spring. The rubber industry, naturally, shared in the let-down, which may be seen from the following. Recently 34 rubber concerns reported employing 17,009 wage earners receiving $461,000, declines of 8.3 and 6.3%, respectively, from the previous month.

Last month, however, automobile production increased more than seasonally. March dealer sales were active, continuing the upward trend noted late in February. It is expected that some plants on shorter schedules will soon adopt the five-day work week.

Ford Motor Co., Dearborn, Mich., last month produced its one-millionth Ford-built tire, a white sidewall type bearing serial number Z-1,000,000, to be placed on exhibit at the Ford Rotunda, the visitor's gateway to the Rouge plant. The first Ford tire was built July 30, 1937, in an experimental "pilot" plant where engineers determined the proper equipment and sequences of operations for the new tire division. The $6,000,000 Rouge tire plant, opened January 3, 1938, embodies scores of departures from conventional rubber manufacturing practices. Covering 4.5 acres, it has 70,000 square feet of special window glass which filters out the ultra-violet rays of the sun to prevent damage to the rubber by oxidation during manufacturing. Production of Ford tires now has reached the rate of 7,500 every 16 hours. Production of Ford inner tubes, begun recently, now exceeds 1,000 per day and is being increased rapidly.

Industrial Rubber Goods Co., manufacturers of mechanical rubber goods, St. Joseph, Mich., recently celebrated its twentieth birthday. A feature of this anniversary was a dinner-dance held in Hotel Whitcomb, arranged by company workers in tribute to Fred C. Palenske, founder and president of the concern. More than 500 employes, city officials, and business men attended.

Midwest Rubber Reclaiming Co., East St. Louis, Ill., through Vice President Gilbert K. Trimble has announced the appointment at the regular monthly meeting on March 17 as a director of Ray R. Semler, superintendent of the Barberton, O., plant, who has been with the company 12 years.

Midwest Power Conference

The annual Midwest Power Conference will be held April 5 to 7 at Palmer House, Chicago, Ill., under the sponsorship of Armour Institute of Technology with the cooperation of Iowa and Michigan State colleges, Purdue University, State University of Iowa, universities of Illinois, Michigan, and Wisconsin, Chicago sections of A.I.E.E., A.I.M. and M.E., and A.S.M.E., Illinois Section, A.S.C.E., Illinois Chapter, A.S.H. and V.E., and Western Society of Engineers.

The sessions will start on April 5 with registration at 9:30 a.m., followed by the opening meeting (10:15 a.m.). Other sessions for the day are: 10:45 a.m., The Achievements of Research in Power; 11:30 a.m., Developments in Central Station Power Plants; 12:15 p.m., Joint Luncheon with A.S.M.E.; 2:00 p.m., Small Power Plants, and Electric Power Generation, Transmission, and Distribution; 4:00 p.m., Metals and Welded Construction.

The program scheduled for April 6 includes: 9:30 a.m., Diesel Power; 11:00 a.m., Rural Electrification; 12:15 p.m., Joint Luncheon with A.I.E.E.; 2:00 p.m., Problems in Air Pollution; 3:30 p.m., Power Equipment; 6:45 p.m., Joint Midwest Power Conference, A.S.M.E. and A.I.E.E. Dinner (Ladies invited).

Listed for April 7 are: 8:30 a.m., Bus to Armour Institute; 9:15 a.m., Special Problems in Power Plants; 11:15 a.m., Inspection Tour of Armour Institute Laboratories; 12:00, Bus to Crane Co. Plant with Luncheon (1:00 p.m.), Inspection of Plant and Research Laboratories (2:00 p.m.), and Return by Bus to Hotel (4:00 p.m.).

Those interested in this conference should communicate with Stanton E. Winston, Conference Secretary, Armour Institute of Technology, 3300 Federal St., Chicago, Ill.

NEW JERSEY

THE majority of New Jersey rubber manufacturers report a little improvement in business which they believe is an indication that conditions will resume an upward trend by early summer. Orders for hard rubber continue to gain after having slowed up during the winter. There has also been reported a better demand for druggists' sundries.

Charles L. Fulkert, vice president and superintendent of Jos. Stokes Rubber Co., Trenton, recently returned after several weeks in Miami, Fla.

Puritan Rubber Co., Trenton, experienced a gradual improvement in business, with the plant operating normally.

Pocono Rubber Co., Trenton, reports more active business than during the previous month.

Whitehead Bros. Rubber Co., Trenton, is erecting an addition to its office. The company is running normally.

Crescent Insulated Wire & Cable Co., Trenton. About 350 persons attended the employes' annual dinner-dance on March 4 at a local hotel. Company officials and labor leader were guests.

Mercer Rubber Co., Hamilton Square, finds business quiet at this time.

Alphaduct Products Corp., Jersey City, recently leased 20,000 square feet of floor space at the Michelin Tire Co. plant, Milltown, to manufacture electric cables and conduits.

Luzerne Rubber Co., Trenton, finds business has increased in the hard rubber goods line.

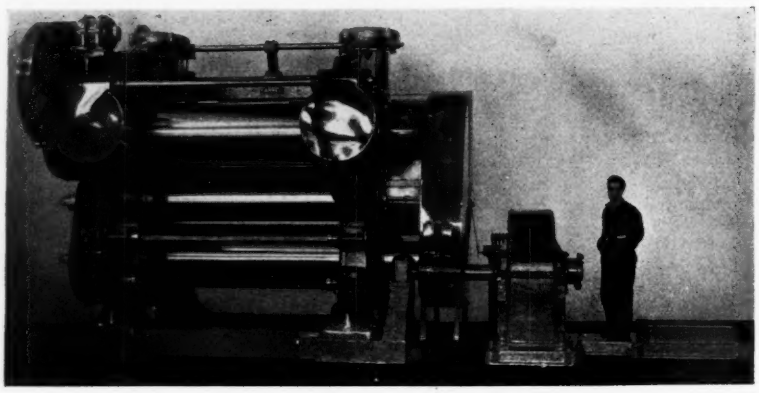
Acme Rubber Mfg. Co., Trenton, has named John R. Lambert to the directorate to fill the vacancy caused by the death of his father, John A. Lambert, who had been vice president, general manager, and treasurer of the concern. James E. and Joseph K. Lambert, brothers of John R., are employed as Acme salesmen.

Harry W. Roberts, president, Pierce-Roberts Rubber Co., Trenton, announced increased orders for druggists' sundries.

Morrison Rubber Co., Trenton, has leased a building on Lalor St. and converted it into an office and warehouse. The company was formerly on Canal St. but changed to larger quarters.

Nearpara Rubber Co., Trenton, announces greater activity in reclaimed rubber, with the plant operating normally.

NEW ENGLAND



Four-Roll 28- by 84-Inch Calender

R. I. to Survey Its Industries

A resolution has been passed by the Rhode Island General Assembly creating a seven-member commission with a $10,000 budget for the next year to study means of attracting new industries to the state and of retaining present industries. The commission to be appointed by the Governor to serve at his pleasure will soon make a survey of available industrial floor space in the state. A pending resolution provides for a study of Rhode Island's labor statutes and legislation by a seven-member commission to consist of three representatives of industry, three of labor, and one of the State Government.

Largest Rubber Calender?

For the purpose of extending historical data regarding rubber machinery your editor is publishing herewith in its entirety a self-explanatory letter and photograph received on March 6.

DEAR MR. STILLWAGON:

On page 42 of your February 1 issue there is an item referring to a 32- by 92-inch Four-Bowl Calender made by Francis Shaw & Co., Ltd., for the Rapson Tyre Co. This is published in connection with a discussion as to who built the largest rubber calender in the world.

I think Farrel-Birmingham Co., Inc., can fairly claim to have built not only the largest calenders, but the greatest number of them. From June, 1914, to October, 1919, we built 26 calenders with 32-inch diameter rolls. Five of these calenders had rolls of 90-inch face; 18 of them had 92-inch face rolls and 3 of them had 100-inch face rolls. These were all three-roll calenders for coating and frictioning the square woven fabric used in tires before cord fabric was developed.

When weftless cord fabric was introduced, we converted four of these 32- by 92-inch calenders to four-roll machines. The abandonment of square woven fabric made the wide calenders unnecessary, and since 1919 the weftless cord calenders have been made with rolls 24- by 68-inch and 28- by 84-inch. Photograph 2953 [shown herewith] illustrates a calender of the latter size.

It may be of interest to add that two of these large calenders were sent to Australia, three to England, one to Italy. The remaining twenty were purchased by companies in the U. S.

The above facts are submitted for the purpose of extending the record and adding to the incomplete information previously published.

Yours very truly,
FARREL-BIRMINGHAM CO., INC.,
T. V. Busk

Information regarding unusual rubber working machinery or equipment is of definite interest to those connected with the industry. Others, who may know of outstanding structural accomplishments or installations, are invited to submit any such information to INDIA RUBBER WORLD.

Rhode Island rubber manufacturers' payrolls during February, according to the Brown Bureau of Business Research, totaled $310,384, 11.7% more than in January and 23.3% more than in February, 1938.

The Stanley Chemical Co., maker of lacquers, synthetics, enamels, and japans, East Berlin, Conn., has appointed Evert D. Cobb direct factory representative in Ohio. To cooperate most effectively with manufacturers on their industrial coating problems, Mr. Cobb received several months of intensive training at East Berlin before going into his territory on February 12.

A. E. Benson, product development manager, Fisk Rubber Corp., Chicopee Falls, Mass., has been named to the International Standards Committee of The Tire & Rim Association, Inc., for 1939. Fisk tires are now used in more than 50 foreign countries.

OBITUARY

George Mooney

GEORGE MOONEY, for 46 years with The H. O. Canfield Co., manufacturer of mechanical rubber goods, Bridgeport, Conn., died on Washington's Birthday of heart disease. Born in Ireland in 1878 and equipped with a grammar school education, Mr. Mooney in 1891 went to work for the late H. O. Canfield, founder of the company, to become assistant foreman five years later. He next was made foreman of the tubing and cutting departments and in 1913 was appointed assistant general superintendent, a position he held until his retirement in 1937 because of ill health.

The deceased, noted as a runner, also belonged to the National Guard and the Foresters of America.

He leaves his wife and a sister.

Funeral services were conducted February 25 at St. James Church, Stratford, Conn., where the deceased had resided. Burial was in St. Michael's Cemetery.

Charles H. Hanna

PNEUMONIA caused the death, on February 12, of Charles H. Hanna, secretary of the Auburn Rubber Corp., Auburn, Ind., with which he had been associated in an executive capacity for a quarter-century. Previously he had been an official of the Auburn Automobile Co.

Mr. Hanna, born in Fort Wayne, Ind., May 5, 1870, was an alumnus of Purdue University and a member of Kappa Sigma.

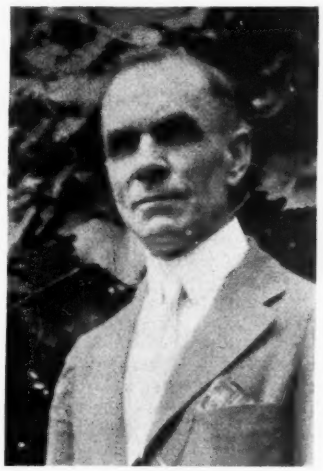
Funeral services and burial took place in Auburn on February 15.

Survivors include his wife, a son, a daughter, three grandchildren, and two brothers.

T. W. Morris

THOMAS W. MORRIS, named rubber technologist by the government, left a valuable contribution to the rubber industry when he died February 20, a victim of pneumonia. In 1917 he invented the Morris automatic trimming machines for removing overflow from molded rubber goods, marking a revolution in trimming as the work had formerly been done almost entirely by hand. Mr. Morris devoted the remainder of his life to his invention, and today his machines may be found in all parts of the world.

Born of English parentage in Pleasant Valley, O., in 1871, and subsequently moving to Akron, Mr. Morris at 16 joined The B. F. Goodrich Co., where he remained and steadily progressed until at 23 he became superintendent for Morgan & Wright Co., Chicago, Ill. He remained with this company for 10 years and helped establish the Chicago Tire & Rubber Co. Mr. Morris was



T. W. Morris

superintendent variously of the La Crosse Rubber Works, La Crosse, Wis., the Cudahy Rubber Co., Cudahy, Wis,, and the Dryden Rubber Co., Chicago.

Mr. Morris is survived by his wife, a son, a daughter, five grandchildren, and two sisters.

Funeral services were conducted in Akron, with burial at Mount Hope Cemetery, February 25.

John F. Newman

JOHN F. NEWMAN, factory superintendent, Vulcan Proofing Co., First Ave. and 58th St., Brooklyn, N. Y., died on March 12 after a very brief illness. He was born in New York, N. Y., 49 years ago. His earlier training and business experience was in the field of structural engineering, including responsible assignments on subway construction in New York. One of his construction responsibilities was the installation of machinery for the manufacture of tires in the C. Kenyon Co., Brooklyn. The Kenyons were so impressed with his ability that they offered him a position in the tire factory. He became superintendent and remained in that capacity until the factory closed in 1930. The Kenyons then put him in charge of the factory of the Vulcan Proofing Co.

John F. Newman

Mr. Newman was well known in Masonic circles and was a member of the Elks. He was also very active in the affairs of St. John's Episcopal Church. He was buried in Evergreen Cemetery.

He is survived by his wife, two brothers and four sisters.

Philip Coyle

PHILIP HENRY COYLE, former manager of the National Rubber Co., Bristol, R. I., died at Seekonk, Mass., on March 6, following a protracted illness. Born in Bristol, March 31, 1858, he joined the rubber company and served in all its departments, becoming manager in 1892. Mr. Coyle was also for many years president of the Bristol Town Council.

B. F. Raymond

A BRAIN tumor caused the death, on March 9, of Barnaby Francis Raymond, manager of mechanical sales and western division mining representative of the United States Rubber Co. in Salt Lake City, Utah. Previous to joining U. S. Rubber in 1929, he had been employed by The B. F. Goodrich Co. and the Colorado Rubber Co.

Mr. Raymond, who was born in Escanaba, Mich., June 22, 1883, is survived by his wife, a son, three brothers, and three sisters.

Funeral services were held on March 12. Interment was in Wasatch Lawn Memorial Park.

Brazil Undertakes Rubber Development

According to the trade agreements concluded between the United States and Brazil on March 8 there is evidence which bears out the anticipated Brazilian action set forth on pages 33 and 34 of the March issue of INDIA RUBBER WORLD. In these agreements, Brazil will undertake, by diversification of its production, extensive rubber operations which will have a tendency to free the United States from dependence upon distant sources of supply, and will tend to reduce price shifts that at times in the past have had a disconcerting effect upon rubber manufacturers in the United States.

Rubber Industry in Europe

GREAT BRITAIN

Tire Prices Protected

Six leading British tire manufacturers have agreed to protect the prices of their tires as from January 2, 1939. The new policy will be followed for a trial period of three months and, if satisfactory, will be continued indefinitely. Effective January 1, 1939, discounts on commercial tires to dealers and large users have been reduced. According to the new arrangement, users of commercial vehicles will pay list price if they have from one car to 24 cars in fleet; list price less 5%, if they have from 25 to 99 cars, and list price less 10%, if 100 cars or more. Dealers' discounts on "giants" are now 7½%; in certain cases 5% net profits are guaranteed on genuine sales to large buyers who would be entitled to discounts off list prices. Distributers' discounts remain at 3¾%.

During 1938 trade in "giants" was very unsatisfactory, both as a result of excess purchasing when price increases for 1938 were announced in December, 1937, and as a result of unfavorable business conditions which caused large numbers of trucks to be put into "dead storage."

Rubber Trade Outlook

On the whole business for rubber goods manufacturers in the latter part of 1938 continued less favorable than in 1937, as rising costs of production and keen competition narrowed margins of profit on many products. But the outlook for 1939 is considered better. Increased demand for private cars started late in 1938 and came from both the home and overseas markets. Rubber goods requirements for British rearmament is another favorable factor. Improvements in the production of rubber floor-coverings have put this material on a competitive basis with the best types of linoleum; the annual increase in consumption of rubber floor-coverings in Great Britain is approximately 750,000 square yards. The annual consumption of linoleums and other floor-coverings is estimated at 50,000,000 square yards.

Rubberized Wool Yarns

"Recent Developments in the Deposition of Rubber on to Textile Fibers" was discussed by Dr. C. M. Blow, of the Wool Industries Research Association, Leeds, at a meeting of the West Riding Section of the Society of Dyers & Colorists and the Yorkshire Section of the Textile Institute. Dr. Blow stated that rubberizing produces strong wool yarns which assist weaving and knitting and permit the use of lower twists with increased fulness. Coarser yarns were more suitable, he said, as greater reduction of twist was possible without rendering the yarn too weak to handle.

In comparative abrasion tests for 12 hours pile carpets woven with rubberized yarn showed little wear and no loss of fiber, whereas those woven with normal yarn were worn to the backing and had shed much loose fiber. Dyeing of the rubberized yarns, it further appears, presents no insuperable difficulties.

Dr. Blow also stated that some minor difficulties in the necessary chemical and mechanical processes would have to be overcome, but these were unimportant when compared to the benefits from the process.

Notes

R. W. Parris, author of "Recent Developments in Rubber Powder," which appears on pages 41-42, 48 of this issue, is one of the junior graduate staff of The Research Association of British Rubber Manufacturers, 105-7 Lansdowne Rd., Croydon, England, who found employment there as a boy and worked his way up the ladder by evening classes. He plans to be married soon.

A recent patent[1] for the manufacture of hydrocarbon mixtures suitable for motor spirits calls for the use of rubber latex in the process. The latter is distilled with a catalyst to give a liquid fraction which upon further treatment results in hydrocarbon products for use in internal-combustion engines.

Imports and Exports

Official figures covering Great Britain's rubber trade during 1936, 1937, and 1938, show a sharp increase in imports of crude rubber, but a decline in exports of manufactures, in some cases below the 1936 level. Raw rubber and latex imports for the three years were respectively 1,383,787 centals (100 pounds), 3,045,074 centals, and 3,769,525 centals.

Total exports of all pneumatic tire outer covers declined from 5,120,382 to 4,741,610 to 3,334,593 units; tubes from 3,730,005 to 3,435,175 to 2,681,447 units. Outer covers for motor vehicles rose from 1,248,434 in 1936 to 1,376,530 in 1937, but dropped to 1,225,049 in 1938. Considerable reductions occurred in shipments to British West Africa, British India, Belgium, France, and Argentina, while shipments to most of the other British countries increased. Imports of rubber footwear increased steadily from 801,462 dozen pairs in 1936 to 926,543 dozen pairs in 1937 and to 1,057,057 dozen pairs in 1938, but the exports fell from 79,374 to 67,869, to 64,828 dozen pairs. Exports of rubber and canvas belting were valued at £311,309 in 1938, against £364,332 in 1937 and £231,466 in 1936.

[1] British patent No. 495,092.

BELGIUM

Sacic, S.A. pour le Commerce et l'Industrie du Caoutchouc, licence Pirelli, has been formed at Brussels, Belgium, with an initial capital of 3,500,000 francs, which was immediately afterward increased to 12,500,000 francs. This concern is to take over all assets, liabilities, manufacturing, and trading of the S.A.C.I.C. and of the Societe Belge Pirelli, both in liquidation. The directors are: I. Orban, president, J. Debruyere, vice president, Comte C. de Kerchove de Denterghem, H. Humbert, and A. Albertini.

RUMANIA

By the terms of a commercial agreement for 1939 between Italy and Rumania, the latter will admit, among other Italian products, automobile tires and tubes to a value of 20,000,000 lei, in addition to other rubber goods.

Rumanian plans to make the country independent of the imports of foreign tires and tubes are progressing slowly, but surely. The Cortadic concern, of Kronstadt, has already started production, and the important Banloc company, which is receiving special state privileges and has an understanding with an American firm, is going ahead with the building of its works. It appears that machinery and other necessary equipment have already arrived from America. The Banloc concern has a capital of 150,000,000 lei.

GERMANY

Synthetics Developed

The rapid and successful development of synthetics for various purposes is constantly stressed at meetings of scientists and economists and in articles in the press. A recent issue of *Gummi-Zeitung* had an article which showed that although the cable industry is largely dependent on foreign imports for raw materials, great strides are being made in replacing these by home-produced substitutes. Artificial silk and wool, synthetic resins and rubber-like products, new methods of construction, are helping to reduce the use of lead, rubber, gutta percha, and imported fabrics and yarns. At the same time it is reported that the German cable industry is busier and more prosperous than it has been in a long time; several firms have had to extend existing buildings and have added new factories; it is expected that others will follow this lead before long.

Plexigum in Cables

At a meeting of a section of the Group for Chemistry of Synthetics, Berlin, December 2, 1938, several investigators discussed synthetics to take the place of lead, rubber, and gutta percha. *Kunststoffe* published some of these papers, one of which treats of Plexigum.[1]

The collective term Plexigum covers various polymerizates based on acryl combinations. Rubber-like types of this material, as Plexigum BB, Plexigum D, as well as a loaded mix consisting of 30% Plexigum BB plus fillers, and known as Stabol, have proved useful to sheath cables to be laid in covered channels and the like, which must show superior resistance to aging and to oils. Still more important for cable manufacture are mixes of Plexigum and other rubber-like products, especially Perbunan. The addition of Plexigum to Perbunan, it has been found, facilitates rolling and extruding of the latter to an unusual degree and at the same time greatly improves its resistance to light, oils, and heat. At present this combination is chiefly used for making ships cables, but other applications are bound to follow.

Plexigum Solutions

Plexigum also has other uses. Thus, solutions of the soft, rubber-like types have been found useful in the manufacture of light-weight waterproof fabrics, especially for artificial silks and woolens, and for coating fabrics for automobile tops. In certain cases Plexigum solutions take the place of rubber solutions or latex for double-texture proofing, and Plexigum dispersions are employed instead of latex as a dressing for the backs of carpets to prevent slipping.

Plexigum further finds a place in the manufacture of imitation leather and leather substitute. It is claimed that when imitation leather is produced by impregnating paper or fabric with Plexigum, it takes a better and more permanent finish than when latex is used.

Plexigum for Dentures

Dental plates made of Plexigum have the advantage over those of rubber in that they have a more natural color and are less irritating, more durable, and take on neither odor nor taste.

The Igelits

Another group of synthetic products intended to take the place of rubber, gutta percha and lead, and discussed at the above-mentioned meeting,[2] is known as the Igelits, which are vinylchloride polymerization products. Two types appear on the market, Igelit PCU and Igelit MP. Both are fine, white, odorless, thermoplastic powders, insoluble in water, non-inflammable, and non-vulcanizable. They show high resistance to various chemicals as well as to oxygen and ozone. They are used both as thermoplastics, when no softener is added, but if combined with a suitable softener, result in masses which resemble and can be worked like soft rubber. As a substitute for hard or soft rubber, Igelit PCU is more valuable than Igelit MP.

Hard Igelit PCU is marketed in the form of sheets, piping, rods, and blocks; the sheets and foils are already used instead of hard rubber for lining vessels and containers for corrosive gases and chemicals, while the piping serves to convey such substances; valves, fittings, armatures etc., are made from the blocks and rods.

Softened Igelit is used for making tubing, channeling, molded mechanical goods, buffers, sleeves, mats, and covers to be used wherever resistance to chemicals and aging is required; also instead of lead and rubber as packing material; and instead of latex, in the manufacture of artificial leathers and double-textured fabrics.

Recently Igelit PCU pastes were developed which are especially recommended for use in spreading, extruding, and dipping processes.

More Buna Tires

Major-General von Hannecken, who directs the supervision of industrial raw materials, was recently reported to have stated in the course of a survey of the German position with regard to supplies of raw material, that production of synthetic rubber is now being pushed ahead at two large factories. Methods of production and output have improved considerably, resulting in a substantial reduction in costs. Tests with tires made from Buna have been successful enough to permit all passenger cars to change over from natural rubber tires to Buna tires during 1939.

Hitherto all-Buna tires do not appear to have been put on the market, although Buna has for some time been used in tire manufacture. It is claimed that Buna tires will cost exactly the same as tires of natural rubber. It may be added that the new popular-priced automobile known as the KdF. car ("Strength through Joy" car), which it is expected will be put out in large numbers in 1940, is to be equipped with all-Buna tires.

BULGARIA

A new rubber factory is reported being constructed in Sophia by Bulgarian cooperative societies with the aid of the Kooperativa Forbundet of Stockholm, Sweden, which is sending Swedish experts to Bulgaria and supplying a portion of the machinery. It is also possible that Swedish capital may become interested in the undertaking.

POLAND

A survey of Poland's rubber industry in 1938 shows 31 establishments manufacturing rubber (of which three were closed), giving employment to 11,380 workers. The chief product is, of course, rubber footwear, and in that year the output included: rubber shoes, 3,843,000 pairs, value 7,630,000 zloty; galoshes, 2,750,000 pairs, value 7,835,000 zloty; and snowshoes, 2,600,000 pairs, value 12,655,000 zloty. Exports of rubber footwear declined from 216 tons, value 777,000 zloty, in 1937, to 158 tons, value 567,000 zloty, in 1938.

Imports of crude rubber have been increasing as far as quantity is concerned, and in 1938 came to 7,973 tons against 6,150 tons. Incidentally, a local press report states that the Polish Ministry of Commerce and Industry has decided that in the period January-April, 1939, permits for the importation of crude rubber will only be obtainable by importers if they buy an amount of Polish synthetic rubber equal to 1.5% of the raw rubber they intend to import. According to the *Rubber News Letter* of March 15, prepared by the Leather and Rubber Division, United States Department of Commerce, information released by the Office of Commercial Attache, Warsaw, on February 8, 1939, indicates that the Polish

(*Continued on page 73*)

[1] "Plexigum in the Place of Gutta Percha, Rubber and Lead," E. Trommsdorff, *Kunststoffe*, Feb., 1939, pp. 45-46.

[2] "The Igelits as Substitutes for Rubber, Gutta Percha and Lead," L. Kollek, *Kunststoffe*, Feb., 1939, pp. 41-43.

Rubber Industry in Far East

INDIA

Rubber Goods Imports

Official figures regarding imports of rubber goods by India during the six months, April 1 to September 30, 1938, again show a considerable decline, due partly to less favorable business conditions, but mainly to increasing local production. Dunlop and Bata have factories near Calcutta.

The total number of pneumatic tires for automobiles imported in this period came to 100,038, against 138,107 units in the similar period of 1937; tubes, 72,453, against 111,829 units; motor cycle tires, 755, against 1,228 units. Pneumatic tires for bicycles decreased to a still greater extent, the number of covers dropping from 556,065 to 253,661, and inner tubes from 956,932 to 384,139 units. The bulk of these goods came from Great Britain; the United States, which in 1937 ranked a second as a supplier of automobile tires to India, in 1938 declined more than Germany to assume third place.

The decline in the imports of footwear, and particularly of the cheapest grade of rubber-soled canvas shoes formerly supplied largely by Japan, may be called sensational. In the fiscal year ended March 31, 1937, imports of the latter type of footwear totaled 1,135,679 pairs; this fell to 385,961 pairs in the fiscal year ending March 31, 1938, and during the succeeding six months to only 91,253 pairs.

Crude Rubber Statistics

The Department of Commercial Intelligence and Statistics reports that the area planted to *Hevea* in India at the end of 1937 was 124,638 acres, against 123,537 acres in 1936; while production of rubber was 32,249,544 pounds, against 30,435,359 pounds. The area under rubber in Burma at the end of 1937 was 104,853 acres, against 103,937 acres in 1936, whereas production was only 14,946,981 pounds in 1937 against 29,679,147 pounds in 1936.

According to *Statistical Bulletin of the International Rubber Regulation Committee*, absorption by India and Burma came to 5,553 long tons in 1938, against 7,172 tons in 1937 and 5,675 tons in 1936.

NETHERLAND INDIA

Tire Imports

In the first half of 1938, imports of automobile tires into Netherland India decreased sharply to 20,989 units as compared with 28,993 units in the last half of 1937. However, the total for the five months from July to November, 1938, increased to 24,022 units. As the entries in December, 1938, are also said to have been heavy, the total for the last half of the year probably equaled that for the last half of 1937.

With regard to local tire production, it is learned that up to the end of September, 1938, there was a steady increase, and average monthly consumption of crude rubber rose from 172 tons in the first quarter to 186 tons in the second and 211 tons in the third quarter and is estimated at 200 tons for the fourth quarter. Incidentally it is said that locally made tires cost about 15% less than the imported articles.

Crude Rubber Exports

Revised figures of crude rubber exports from Netherland India in December, 1938, as issued by the Central Bureau of Statistics, place the total for estate rubber from Java and Madura at 1,934,955 kilos, which included 6,887 kilos latex and 31,948 kilos in the form of tires. Estate rubber shipments from the Outer Provinces came to 4,841,906 kilos and included 846,005 kilos latex. Native rubber exports came to 4,031,000 kilos. Preliminary figures for January, 1939, show a remarkable increase in shipments.

Packing Rubber

The leading association of rubber exporters in Batavia is considering a change from the usual triplex boxes used for packing rubber, to baling material, the *Bataviaasche Nieuwsblad* states. The price of wooden boxes, usually imported from Japan, appears to have been increased by over 30% and shipments have been irregular.

A certain amount of rubber has been shipped in bales, which are more economical and apparently the universal use of bales is now under consideration.

Extension Allowances

The new rubber restriction agreement permits new planting up to 5% of existing rubber acreages and thus native rubber growers in Netherland India are entitled to extend their holdings. However, it has been decided not to allot the allowances indiscriminately to districts irrespective of their needs. Thus in the case of Djambi, probably the largest native rubber-growing district in Sumatra and with a rubber area already too large for native exploitation, it was resolved at a meeting with local headmen that half of the extension allowable to this section should be offered to other districts which need it more. The other half is to be made available to natives who do not own rubber gardens and who will, on application, be allowed to plant about 400 trees if they use only selected planting material which the government will supply at cost price.

The attitude of the government is that in order to maintain the present position of native rubber in relation to estate improvements, it is important that natives should use improved material on their extensions. Consequently, efforts will be made to promote the use of selected seed by growers, especially in Palembang, Benkoelen, and the Lampongs, where interest in new planting is reported.

CEYLON

Rubber shipments from Ceylon in 1938 totaled 49,282 tons; whereas permissible export allowance was 45,375 tons. Ceylon therefore again over-exported, this time 3,907 tons. As she had over-exported 3,238 tons at the end of 1937, the total excess is now 7,145 tons.

According to Article 5 of the International Rubber Regulation Agreement, contracting parties are allowed to exceed permissible export allowances by not more than 5% in any one year, and the over-export is to be deducted from the exports in the following year. As 5% of Ceylon's permissible allowance for 1938 is only 2,268 tons, it would seem that she committed a breach of this particular article. It may be added that Ceylon is said to have appealed to the International Rubber Regulation Committee in July, 1938, for permission to exceed her allowance by 10,000 tons at the end of 1938, but it is not known what the response was.

MALAYA

Over-Exports

Latest figures indicate that Malaya actually exported 345,300 tons of rubber in 1938 against permissible exports of 331,100 tons, an excess of 14,200 tons. As there was a shortage of exports at the end of 1937 amounting to 2,800 tons, the net excess for 1938 comes to 11,400 tons. These over-exports have been strongly criticized; the *Straits Times* especially took a strong attitude on the matter and early suggested there was something wrong with the manner of assessment.

The Malayan controller, as reported in these columns last month, is attempting to correct the excess by imposing a domestic cut in imports of 2½%, which is, of course, none too welcome, especially since the quota remains at 50%. The excess is explained in part by the fact that export credits issued to producers were based on domestic assessments—which gave a higher total than the international basic quota—while the international rate of exports was used. Malaya's basic quota was 602,000 tons for the year; whereas the total for local assessments was 612,000 tons, a difference of 10,000 tons. With an average exportable percentage of 55 for the year, there was an over-issue of credits covering in all a total of 5,500 tons.

Automatic cancellation at the end of each quarter of unused credits still in the hands of producers reduced this figure to around 4,000 tons, the controller calculates.

The heavy decline in dealers' stocks from 17,738 tons to 7,529 tons accounted for the remaining 10,000 tons. This unexpected reduction in stocks was said to have been due to excessive demand when the erport quota was cut to 45% and to clearance of stocks to avoid payment of the increase in cess on September 1, 1938.

Assessments of Budded Areas

From the very outset, when rubber restriction was introduced, there have been grumblings about the local assessments, especially on budded rubber. It seems to have been the policy to take for granted that because a tree was from a certain clone and had attained a certain age and girth, it could produce a specified amount of rubber. Experience, of course, has shown that there is often a wide variation in yield capacity of the same clone when grown under different conditions. Critics claim that large areas have received assessments where no tapping has ever been done, and that in several cases assessments have been considerably above the yield power of the trees. Certainly reports of leading rubber companies say very little about the crop from their budded areas, but do frequently contain the statement that although budded areas have reached the tapping stage, it has for various reasons been considered advisable to postpone tapping. At times the trees involved are seven to eight years old.

Company News

The Jeram Rubber Estates, Ltd., is to acquire the Bukit Jalil estate of the Cromlix Rubber Estate & Produce Syndicate, Ltd. The estate, which is in Selangor and has an area of 1,266 acres, will change hands for 10,000 £1 shares in the Jeram company, and accordingly the latter proposes to increase its authorized capital of £150,000 to £160,000. The Jeram shares are at present quoted at 18s. 6d.

Raub Rubber Estates, Ltd., is to go into liquidation. Its assets and holdings in Hoscote Rubber Estates, Ltd., are to be distributed to the shareholders of the company.

Glenealy Plantations, Ltd., has acquired 155 acres of jungle land adjoining the Glenealy division. The company has been allotted planting rights covering something over 65 acres, and further rights have been purchased to make up the above total. The land is already being felled preparatory to planting.

Rubber Research Institute

H. J. Page, director of the Rubber Research Institute of Malaya, is on leave in England, until June.

W. S. Davey has been appointed head of the Chemical Division of the Rubber Research Institute of Malaya in place of Dr. E. Rhodes, who resigned to join the British Rubber Producers' Research Association. Mr. Davey, who until recently was senior chemist on the staff of the London Advisory Committee for Rubber Research (Ceylon and Malaya) at the Imperial Institute, left England in March for a short visit to the United States to attend the meeting of the Rubber Division of the American Chemical Society at Baltimore and to meet representatives of the principal latex and rubber manufacturing interests in America. He leaves for Malaya from Vancouver on April 14.

INDO-CHINA

Rubber production in Indo-China has risen from 19,600 tons in 1934 to 58,518 tons in 1938. A French paper states that in 1938 all French rubber needs were covered by rubber produced in French territories and that in 1939 there will be an excess production valued at over 150,000,000 francs.

POLAND

(*Continued from page 71*)

firm "Stomil" has an initial capacity of 900 metric tons of synthetic rubber per year. However actual output consists of a quantity necessary to maintain plant operation because the high production cost is entirely out of line with the price of crude rubber. The synthetic rubber is retailed at 5.60 zloty per kilogram (2.54 per pound). This plant is capable of expansion in case of emergency.

Another report says that a new accelerator for rubber having the characteristics of Thiuram has been developed by the Boruta concern and will be sold under the name Resinol T. It is understood that equipment has already been installed by the firm for production on a scale sufficient to cover the needs of the Polish market.

ITALY

At the last meeting of the Interministerial Self-Sufficiency Committee it was agreed that the first synthetic rubber factory be erected by the IRI-Pirelli Group, in the industrial zone of Ferrara. It is further reported that the planting of rubber-bearing plants has begun in suitable areas in Italy and in Africa.

Pirelli Italiana, which has a capital of 300,000,000 lire, declared a dividend of 11% as compared with 13% in 1937. The holding company, Pirelli & Co., again paid a dividend of 13% as in the preceding year.

CANADA

The Barringham Rubber Co., Ltd., Oakville, Ont., Canada, recently was organized to manufacture baby pants, crib sheets, rain capes, bathing caps, balls, hospital sheeting, quarter and sock linings, rubberized fabrics, molded sponge rubber items, slabs, sport soles, tubing, hose, camel back, tape, elastic bands, etc. Founder, president, and general manager is Edward Barringham, founder and president, until he sold his interests a year ago, of the Canadian General Rubber Co., Galt, Ont. He recently purchased the land, buildings, and equipment formerly owned by the General Tire & Rubber Co. in Oakdale and is reconditioning them for rubber goods manufacturing. The factory, which has 22,000 square feet of floor space, a railroad siding, and about seven acres of land, was scheduled to go into production last month with from 50 to 100 employes. Other officers are C. F. Elderkin, vice president, and C. M. Barringham and M. Ogden Haskell, directors.

Patents and Trade Marks

MACHINERY

United States

3,147,081. **Tire Vulcanizing Mold.** G. O. Beckman, assignor to Super Mold Corp. of California, Lodi, Calif.

2,147,190. **Textile Machine Lint Collector.** C. C. Cadden, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,147,218. **Rubber Article Mold.** S. R. Reimel, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,147,339. **Recapping Mold.** E. A. Glynn, assignor to Super Mold Corp. of California, both of Lodi, Calif.

2,148,079. **Plastic Article Mold.** H. Martin, Jr., Wadsworth, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,148,162. **Cord Stretcher.** C. J. Killette, Hogansville, Ga., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,148,416. **Vulcanizer.** J. W. Brundage, assignor to Summit Mold & Machine Co., both of Akron, O.

2,148,572. **Rubber Treating Apparatus.** H. R. Minor, assignor to Industrial Process Corp., both of Dayton, O.

2,148,663. **Tire Vulcanizer.** T. Wallace, assignor to L. Wallace, both of Chicago, Ill.

2,149,150. **Chain Looping Apparatus.** F. Slusher, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,149,604. **Casing Form.** F. L. Johnson, Akron, O.

2,149,797. **Tube Inflator.** A. A. Starke, assignor of 25% to G. Casci, 20% to G. Casci, 20% to E. Starke, and 10% to D. Cassettari, all of Reno, Nev.

2,150,267. **Tube Vulcanizer.** F. Delano, Huntington Park, assignor of one-third to H. W. Crosswhite, Maywood, and one-third to F. Maigre, Huntington Park, both in Calif.

United Kingdom

494,982. **Loom.** C. Clutsom.

495,048. **Thread Manufacturing Apparatus.** W. M. Spencer.

495,144. **Hose Extruder.** H. Heidrich.

495,520. **Vulcanizer.** R. A. Dufour, and H. A. Leduc.

495,693. **Sole and Heel Applier.** J. Bousie.

495,817. **Tire Mold.** Firestone Tire & Rubber Co., Ltd.

496,291. **Sole Machine.** British United Shoe Machinery Co., Ltd., and G. Hazelton.

496,455. **Tire Core.** Dunlop Rubber Co., Ltd.

496,600. **Rubber Article Mold Apparatus.** M. Goldschmidt.

496,761. **Dipping Apparatus.** A. N. Spanel.

497,100. **Vulcanizer.** Boston Woven Hose & Rubber Co.

Germany

671,521. **Ball-covering Machine.** H. N. Huse, Providence, R. I., U. S. A. Represented by H. Fecht, Berlin-Charlottenburg.

671,556. **Molded Goods Vulcanizer.** Continental Gummi-Werke, A. G., Hannover.

PROCESS

United States

2,146,870. **Upholstery Stuffing Treatment.** E. O. Whiteley, San Francisco, Calif.

2,146,965 and 2,146,966. **Elastic Fabrics.** S. C. Lilley, Hamden, assignor to American Mills Co., New Haven, both in Conn.

2,147,293. **Applying Latex to Deposition Bases.** M. E. Hansen, assignor to American Anode, Inc., Akron, O.

2,147,312. **Eliminating Tack.** E. G. Partridge, Stow, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,147,680. **Rubber Manufacture.** H. P. Stevens, London, England, assignor by mesne assignments, to G. R. Beach, Jr., Chadds Ford, Pa.

2,147,736. **Fabric.** C. Dreyfus, New York, N. Y.

2,148,526. **Treating Electrical Conductors.** S. E. Brillhart, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,148,830. **Rubber Chloride.** C. O. North, Charleston, W. Va.; M. R. North, administratrix of estate of C. O. North, deceased, assignor to Raolin Corp., Charleston, W. Va.

2,148,831. **Rubber Chloride.** J. W. Raynolds, Nitro, assignor to Raolin Corp., Charleston, both in W. Va.

2,148,833. **Rubber Chloride.** J. W. Raynolds, Nitro, assignor to Raolin Corp., Charleston, both in W. Va.

2,149,031. **Warp Goods with Rubber Threads.** P. Schönfeld, Chemnitz, Germany.

2,149,032. **Warp Goods.** P. Schönfeld, Chemnitz, Germany.

2,149,425. **Rubber Thread.** M. Draemann, Cologne-Braunsfeld, Germany.

2,149,465. **Playing Ball.** J. T. Riddell, Chicago, Ill.

2,149,484. **Cycle Halogen.** H. A. Winkelmann and E. W. Moffett, both of Chicago, Ill., assignors to Marbon Corp., a corporation of Del.

2,149,532. **Liner Material.** C. E. McManus, Spring Lake, N. J., assignor to Crown Cork & Seal Co., Inc., Baltimore, Md.

2,149,750. **Waterproof Fabrics.** F. F. Schwartz, Paris, France, assignor, by direct and mesne assignments, to American Ecla Corp., Dover, Del.

2,149,902. **Vibration Insulators.** C. Saurer, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,149,913. **Perforated Fabric.** C. D. Gilpin, Westfield, N. J., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

2,149,961. **Thickening Latex.** W. H. Holst, Tamaqua, Pa., assignor to Atlas Powder Co., Wilmington, Del.

2,149,991. **Rubber Lining.** H. M. Dodge, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,150,068. **Artificial Rubber.** E. Kleiber, Lugano, assignor to Hevapar S.A., Geneva, both in Switzerland.

2,150,111. **Wheel Structures.** J. W. Tatter, assignor, by mesne assignments, to Firestone Tire & Rubber Co., both of Akron, O.

2,150,178. **Sponge Rubber.** F. J. Maywald and F. J. Maywald, Jr., both of Rutherford, N. J.

2,150,282. **Joints and Joint Strips.** H. C. and T. Lord, both of Erie, Pa.; T. Lord assignor to H. C. Lord.

2,150,287. **Sponge Rubber.** H. R. Minor, assignor to Industrial Process Corp., both of Dayton, O.

2,150,412. **Hose.** J. D. Berwick, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,652. **Fabric Construction.** B. H. Foster, Maplewood, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

Dominion of Canada

379,616. **Elastic Fabric.** F. F. Schwartz and M. A. Chavannes, co-inventors, both of Paris, France.

379,682. **Rubber-Covered Roll.** Stowe-Woodward, Inc., Newton Upper Falls, Mass., assignee of S. B. Ward, Portsmouth, N. H., both in the U. S. A.

379,824. **"Tailors' Canvas."** E. A. C. A. and P. C. L. A. Gheysens, co-inventors, both of Iseghem, Belgium.

United Kingdom

494,509. **Thread or Cord.** Dunlop Rubber Co., Ltd., Dunlop Cotton Mills, Ltd., J. Anderson, and M. Langstreth.

495,021. **Gas-Expanded Rubber.** Expanded Rubber Co., Ltd., and F. De Lautour.

495,703. **Rubber Substitutes.** R. H. A. M. Bamberger.

495,710. **Accumulator Plate.** Compagnie Generale D'Electricite.

496,669. **Grinding Cements.** C. E. Every, (F. L. Smidth & Co. A.G.).

496,691. **Flexible Tube.** Superflexit, Ltd., and W. H. Grint.

496,794. **Battery.** International Latex Processes, Ltd.

497,185. **Tank Linings, Etc.** Gewerkschaft Keramchemie-Berggarten.

Germany

671,473. **Elastic Textile Goods.** Scott & Williams, Inc., Jamaica, L. I., N. Y., U. S. A. Represented by F. Meffert, L. Sell, and E. Schlumberger, all of Berlin.

671,832. **Hose.** Thuringer Schlauchweberei und Gummiwerk A.G., Waltershausen, Thur.

CHEMICAL

United States

2,147,620. **Composite Product.** H. A. Winkelmann and E. W. Moffett, both

of Chicago, Ill., assignors to Marbon Corp., a corporation of Del.

2,147,739. **Rubber Hydrochloride.** E. Gebauer-Fuelnegg, deceased, late of Evanston, Ill., by M. Gebauer-Fuelnegg, Evanston, administratrix, E. W. Moffett, Chicago, both in Ill., and H. F. Irving, Gary, Ind., assignors to Marbon Corp., a corporation of Del.

2,147,757. **Coated Material Composition.** G. Schneider, Montclair, N. J., assignor to Celanese Corp. of America, a corporation of Del.

2,148,127 and 2,148,128. **Insulating Composition.** B. D. McIntyre, assignor to Insulation Development Corp., both of Monroe, Mich.

2,148,832. **Rubber Chloride Composition.** J. W. Raynolds, Nitro, assignor to Raolin Corp., Charleston, both in W. Va.

2,149,211 and 2,149,212. **Colored Rubber Products.** E. Fischer, Offenbach a.M., Germany, assignor to General Aniline Works, Inc., New York, N. Y.

2,149,458. **Rubber Derivative.** E. W. Moffett, Chicago, Ill., assignor to Marbon Corp., a corporation of Del.

2,149,858 and 2,149,859. **Accelerator.** C. O. Miserentino, assignor to Dunlop Tire & Rubber Corp., both of Buffalo, N. Y.

2,149,926. **Chlorinated Rubber Product.** J. G. Moore, Runcorn, and L. T. Dod, Great Crosby, Liverpool, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,150,421. **Antioxidant.** H. I. Cramer, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,422. **Hydrogenated Furyl Amine Derivatives.** H. I. Cramer, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,423. **Furyl Amine Derivatives.** H. I. Cramer, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,424 and 2,150,425. **Accelerators.** H. I. Cramer, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,463. **Mercaptothiazole Derivatives.** L. B. Sebrell, Silver Lake, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,475. **Stabilization of Dithiocarbamates.** C. F. Winans, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,150,506. **Synthetic Resin.** J. H. Kelly, Jr., Chicago, Ill.

Dominion of Canada

379,554. **Coated Fabric.** Canadian Industries, Ltd., Montreal, P. Q., assignee of A. M. Alvarado and R. B. Flint, both of Wilmington, Del., and L. P. Hubbuch, Springfield, Pa., coinventors, both in the U. S. A.

379,560. **Latex Composition.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of E. V. Anderson, Naugatuck, Conn., U. S. A.

United Kingdom

495,092. **Motor Fuel.** C. Agnoletto.

495,425. **Concrete Composition.** A. E. Bond.

495,467. **Film Material.** H. P. Kaufmann.

496,290. **Vulcanizing Materials.** H. D. Elkington, (Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij).

496,400. **Cable Impregnation.** Commercial Secretaries, Ltd., and P. Dunsheath.

496,443. **Synthetic Rubber.** I. G. Farbenindustrie A.G.

496,560. **Accelerators.** W. E. Messer and Belvedere Chemical Co., Ltd.,

496,585. **Roller Covering Composition.** A. L. Freedlander.

496,780. **Latex Treating Composition.** Chemische Fabrik J. A. Benckiser Ges., and A. Volz.

496,966. **Preserving Rubber.** Standard Oil Development Co.

496,972. **Antioxidants.** Wingfoot Corp.

497,137. **Synthetic Resin Compositions.** United States Rubber Products, Inc.

497,256. **Coating Composition.** E. W. Hultman.

497,262. **Insulating Composition.** C. I. Snow and Imperial Chemical Industries, Ltd.

497,418. **Preserving Rubber.** Wingfoot Corp.

497,420 and 497,421. **Synthetic Rubber.** E. I. du Pont de Nemours & Co., Inc.

Germany

671,422. **Rubber Thread.** T. L. Shepherd, London, England. Represented by W. Stort, Berlin.

671,480. **Reclaiming Vulcanized Rubber.** E. Galle, Brunn. Czecho-Slovakia. Represented by L. Braun and H. Klussmann, both of Ludwigshafen, Rhein.

671,632. **Filler for Rubber Mixes.** Lackfabrik Stormarn Schmidt & Co., Hamburg-Wandsbek.

671,861. **Extracting Fibers from Fabric Containing Vulcanized Rubber.** C. Georgi, Berlin-Zehlendorf.

672,169. **Dissolving, Softening, Gelatination, and Swelling Agent.** Deutsche-Hydrierwerke A.G., Rodleben, Post Dessau-Rosslau.

GENERAL

United States

21,006. (Reissue). **Flexible Conduit.** A. E. Brickman, Rostravor Township, Pa., and G. A. Gleason, Worcester, Mass., assignors to American Steel & Wire Co. of New Jersey, a corporation of N. J.

2,146,766. **Coupling.** L. Ricefield, Oak Park, Ill.

2,146,888. **Sock.** A. Fisch, Heidelberg, Germany.

2,146,942. **Tire.** E. J. Czerwin, Newark, N. J.

2,146,971. **Sealed Container Structure.** J. W. McIlwraith and T. C. Post, assignors to Associated Box Corp., both of New Castle, Pa.

2,146,972. **Baton.** F. W. Miller, Chicago, Ill., assignor to C. G. Conn., Ltd., Elkhart, Ind.

2,146,978. **Tire Inflator.** L. C. Oree and P. J. Williams, both of Au Sable Forks, N. Y.

2,146,983. **Water Softener.** E. Pick, New York, N. Y., assignor to Permutit Co. (1934), Wilmington, Del.

2,147,072. **Swab.** R. A. Wilson, San Antonio, Tex.

2,147,113. **Windshield Wiper.** T. J. Smulski, assignor, by mesne assignments, to Anderson Co., both of Gary, Ind.

2,147,124. **Hose.** T. J. Litle, Jr., assignor to Easy Washing Machine Corp., both of Syracuse, N. Y.

2,147,153. **Valve Stem.** J. C. Crowley, Cleveland Heights, assignor to Dill Mfg. Co., Cleveland, both in O.

2,147,164. **Tube Closure.** J. R. Kent, East Akron, assignor to B. B. Fleck, Warren, both in O., and himself.

2,147,166. **Undergarment.** W. Kops, assignor to Kops Bros., Inc., both of New York, N. Y.

2,147,169. **Elastic Fabric.** W. Mendel, Beverly, and J. Titone, assignors to Neidich Cel-Lus-Tra Corp., both of Burlington, both in N. J.

2,147,197. **Shoe.** A. A. Glidden, assignor to Hood Rubber Co., Inc., both of Watertown, Mass.

2,147,199. **Pipe Conveyer Elevator.** H. W. Hapman, Detroit, Mich.

2,147,265. **Garment.** M. Nelson, New York, N. Y.

2,147,362. **Cushioning Material.** J. E. Bloomberg, assignor to Milwaukee Saddlery Co., both of Milwaukee, Wis.

2,147,384. **Package.** L. L. Salfisberg, South Orange, assignor to Ivers-Lee Co., Newark, both in N. J.

2,147,402. **Cable.** I. T. Faucett, Westerleigh, assignor to General Cable Corp., New York, both in N. Y.

2,147,458. **Fluid Applicator.** C. J. Rohland, Seekonk, Mass., assignor to Nestle-Le Mur Co., New York, N. Y.

2,147,504. **Cap.** A. N. Spanel, Rochester, N. Y.

2,147,505. **Shield.** A. N. Spanel, Rochester, N. Y.

2,147,518. **Spring Suspension.** W. Boxan, Zschopau, assignor to Auto Union A.G., Chemnitz, both in Germany.

2,147,616. **Syringe.** E. J. Chaput, Detroit, Mich.

2,147,660. **Vibration Dampener.** J. S. Loewus, Baltimore, Md.

2,147,700. **Threshold Plate.** W. J. Hennessy, San Francisco, Calif., assignor to Johns-Manville Corp., New York, N. Y.

2,147,802. **Eyeglass Pad.** M. B. Scharfeld, Cleveland, O.

2,147,826. **Door Latch.** A. A. Cripps, assignor to Ternstedt Mfg. Co., both of Detroit, Mich.

2,147,861. **Soap Tray.** F. E. Shopen, Omaha, Neb.

2,148,041. **Container Closure.** R. S. Skinner, Sentinel, Okla.

2,148,101. **Sealing Assembly.** F. F. Brucker, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,148,111. **Tire Tool.** W. A. Dennis, Los Angeles, Calif.

2,148,236. **Fountain Pen.** B. W. Hanle, Elizabeth, N. J., assignor to Eagle Pencil Co., a corporation of Del.

2,148,246. **Tire Inflating and Brake Operating Mechanism.** R. S. Sanford, New York, N. Y., assignor to Bendix Products Corp., South Bend, Ind.

2,148,343. **Tire.** P. H. Flautt, assignor of one-fourth to C. R. Cunliffe and one-fourth to E. W. Waldron, all of Baltimore, Md.

2,148,401. **Curtain.** A. L. Ellis, Jr., Plymouth, assignor to A. L. Ellis & Co., Inc., Boston, both in Mass.

2,148,419. **Distributer.** J. E. Parker, Yorba Linda, Calif.

2,148,637. **Glasses Case.** A. H. Oldham, Pittsburgh, Pa., assignor to M. E. Van Orden, Ithaca, N. Y.

2,148,684. **Eraser Tip.** I. Chesler,

Oceanport, N. J., assignor to Eagle Pencil Co., New York, N. Y.

2,148,740. **Pump.** E. B. Fuqua, Memphis, Tenn

2,148,771. **Hairdressing Cap.** B. Nichthauser, New York, N. Y.

2,148,788. **Hat Saddle.** G. Tomsic, Oceanside, N. Y.

2,148,853. **Fountain Pen.** H. J. Bessette, assignor to Le Boeuf-Pilgrim Pen Co., Inc., both of Springfield, Mass.

2,148,917. **Wiping Device.** F. von Heinrich, Budapest, Hungary.

2,148,924. **Spring Wheel.** C. Berry, Abilene, Tex.

2,148,959. **Stop Nut.** V. H. Pavlecka, assignor to Douglas Aircraft Co., Inc., both of Santa Monica, Calif.

2,148,995. **Wheel.** E. A. Nelson, St. Clair Shores, Mich., assignor of 50% to D. Young and 25% to F. W. Gay.

2,148,999. **Insole.** M. O. Schur and F. W. Vogel, assignors to Brown Co., all of Berlin, N. H.

2,149,079. **Tire Bead.** J. W. White, Wadsworth, and P. A. Frank and F. J. Shook, both of Akron, both in O., assignors to National Standard Co., Niles, Mich.

2,149,102. **Footwear Protector.** G. H. Quennard, Morristown, N. J., assignor to Quennard Latex Products Corp., New York, N. Y.

2,149,128. **Skirt.** A. Thorner, Flushing, and H. J. Perahia, Brooklyn, both in N. Y.

2,149,147. **Fluid Seal Diaphragm.** R. O. Peterson, Glenn Ellyn, and W. F. Bernstein, Brookfield, assignors to Victor Mfg. & Gasket Co., Chicago, all in Ill.

2,149,170. **Rubber Article.** L. P. Gould, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,149,199. **Tubular Rivet.** H. E. Waner, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,149,205. **Tire Rim.** W. S. Brink, assignor, by mesne assignments, to Firestone Tire & Rubber Co., both of Akron, O.

2,149,278. **Track Laying Vehicle Wheel.** J. K. Christmas, United States Army, Easton, Pa.

2,149,297. **Vehicle Suspension.** H. A. Knox, Washington, D. C.

2,149,349. **Rubber Tired Roller.** F. K. Kilian, assignor to Kilian Mfg. Corp., both of Syracuse, N. Y.

2,149,375. **Doorknob.** H. H. Wiebe, Minneapolis, Minn.

2,149,377. **Bottle Capping Apparatus.** E. N. Winslow, Shaker Heights, O., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,149,395. **Tire Contracting Tool.** E. A. Glynn, assignor to Super Mold Corp. of Calif., both of Lodi, Calif.

2,149,533. **Container Closure.** C. E. McManus, assignor to Crown Cork & Seal Co., Inc., both of Baltimore, Md.

2,149,535. **Horseshoe Wear-Protectors.** O. Miöen, Stockholm, Sweden.

2,149,552. **Shoe.** S. Schlesinger, Brooklyn, and W. Seidenberg, New York, both in N. Y.

2,149,557. **Fountain Pen.** J. A. Snodgrass, Prescott, Ark.

2,149,567. **Machinery Hold-Up.** H. M. Bacon, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.

2,149,568. **Machinery Picker.** H. M. Bacon, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.

Dominion of Canada

379,537. **Vacuum Cleaner.** Air-Way Electric Appliance Corp., assignee of D. M. Dow, both of Toledo, O., U. S. A.

379,597. **Trolley Base.** Transit Research Corp., assignee of E. H. Piron, both of New York, N. Y., U. S. A.

379,600. **Hose.** Wingfoot Corp., Wilmington, Del., assignee of E. G. Kimmich, Akron, O., both in the U. S. A.

379,601. **Hose.** Wingfoot Corp., Wilmington, Del., assignee of E. G. Kimmich and J. L. Cutlen, both of Akron, O., both in the U. S. A.

379,607. **Tie-Band.** R. H. Wilbur, Melrose, assignee of J. D. Lane, Boston, both in Mass., U. S. A.

379,660. **Tire Tread.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of E. Eger, Grosse Pointe Park, Mich., U. S. A.

379,757. **Pasteurizer and Churn Shaft Packing Box.** De Laval Co., Ltd., Peterborough, Ont., assignee of C. H. Hapgood, Nutley, N. J., U. S. A.

379,765. **Washing Machine Agitator.** Easy Washing Machine Corp., assignee of T. J. Litle, Jr., both of Syracuse, N. Y., U. S. A.

379,769. **Resilient Mounting.** Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., assignee of C. E. Workman and L. M. Kubaugh, co-inventors, both of Akron, O., U. S. A.

379,779. **Toothbrush Massage Device.** Lactona, Inc., assignee of G. W. Benz, both of St. Paul, Minn., U. S. A.

379,834. **Elastic Knitted Fabric.** J. L. Getaz, Maryville, Tenn., U. S. A.

379,835. **Steering Wheel Rim Cover.** K. E. Goit, Minneapolis, Minn., U. S. A.

379,840. **Ball Elastic Support.** R. Heimers, Mexico City, Mexico.

379,952. **Fountain Pen.** L. J. Gondarowski, M. S. Kochanek, and A. F. Krawiec, co-inventors, all of New York Mills, N. Y., U. S. A.

379,963. **Joint Assembly.** T. L. Fawick, Akron, O., U. S. A.

United Kingdom

494,072. **Bobbin Holder.** H. D. Elkington, (Hungarian Rubber Goods Factory, Ltd.)

494,301. **Mats.** K. H. Hacklander and Hacklander (Mohair Fabrics), Ltd.

494,739. **Rotary-Wing Aircraft.** Cierva Autogiro Co., Ltd., and J. A. J. Bennett.

494,785. **Electric Immersion Heater.** G. Thornton-Norris.

494,811. **Resilient Support.** M. F. A. Julien.

494,851. **Resilient Mounting.** R. A. Lister & Co., Ltd., and B. Wilkinson.

494,880. **Gas Filter.** Soc. Italiana Pirelli.

494,986. **Screw-Thread Grinding Wheel.** F. Forg.

495,014. **Maternity Belt.** Russell Bros. (Teddington), Ltd., and E. M. Bennett.

495,076. **Recording-Apparatus.** H. H. Logan.

495,372. **Carton for Liquids.** G. Lacour.

495,480. **Soap Holder.** C. I. Meyer.

495,553. **Blind Roller.** E. T. Lauriala.

495,588. **Stippling Device.** J. L. Brooks.

495,608. **Addressing Machine.** Adrema Maschinenbauges.

495,634. **Engine Mounting.** C. C. Pounder, A. Blair, and F. E. Rebbeck.

TRADE MARKS

United States

364,690. Representation of a winged foot and the word: **"Goodyear."** Automobile robes. Goodyear Tire & Rubber Co., Akron, O.

364,762. **Klearsight.** Lamp shade covers. Transparent Cover Co., Chicago, Ill.

364,764. **Heatex.** Insulated wire. Acme Wire Co., New Haven, Conn.

364,796. **Parabond.** Construction materials. Parabond Corp. of America, Boston, Mass.

364,801. **Mercury.** Tires and inner tubes. Denman Tire & Rubber Co., Warren, O.

364,838. Representation of an Indian's head and the words: **"Rain-Chief."** Windshield wiper blades. Sleetex Co., Inc., New York, N. Y.

364,860. **Uscoloid.** Battery separators. United States Battery Products, Inc., assignor to United States Rubber Co., both of New York, N. Y.

364,874. **Bull Dog.** Rubber coverings for rolls. Boston Woven Hose & Rubber Co., Cambridge, Mass.

364,904. **Customwheel.** Tires and inner tubes. Westminster Tire Corp., New York, N. Y.

364,908. **Ground Grip.** Tires. Firestone Tire & Rubber Co., Akron, O.

364,938. **Convoy.** Tires. Firestone Tire & Rubber Co., Akron, O.

364,948. **Plastaid.** Softeners. Binney & Smith Co., New York, N. Y.

364,954. Representation of a globe containing the word: **"Unitas."** Dental rubber. Osteroder Gummiwerk Josef Weinand, Osterode, Germany.

365,046. **Tourney.** Golf balls. MacGregor Co., Dayton, O.

365,089. **Glasstex.** Storage batteries. B. F. Goodrich Co., New York, N. Y.

365,114. **Train-En.** Play balls and playsets including balls. Sponge Rubber Products Co., Derby, Conn.

365,285. Representation of a label containing the words: **"Convertible Five Ply Bead to Bead Custom Craft"** and a shield containing the letters: **"CC."** Tires. Norwalk Tire & Rubber Co., Norwalk, Conn.

365,317. **Hi-There! Fortuna.** Girdles and combination girdle-step-ins. Wolfe & Lang, Inc., New York, N. Y.

365,338. Double circle containing the letter: **"D."** Tires and belts. Dayton Rubber Mfg. Co., Dayton, O.

365,340. **Bialastic.** Corsets. Franco Corset Co., New York, N. Y.

365,362. **Belle of Bali.** Brassieres, corsets, girdles, etc. Fay-Miss Brassiere Co., Inc., New York, N. Y.

365,389. **Allastic.** Corsets, girdles, etc. Vanity Corset Co., Inc., New York, N. Y.

365,401. **Dagmar.** Heels and soles. Hagerstown Rubber Co., Hagerstown, Md.

365,419. **Stannox.** Foot balls, soccer balls, basket balls, toys, etc. Ely & Walker Dry Goods Co., St. Louis, Mo.

365,453. Representation of a female figure. Brassieres, corsets, etc. Maiden Form Brassiere Co., Inc., New York, N. Y.

365,476. Design of representation of a circle and horizontal and vertical lines. Rubber repair and replacement parts for vehicle braking apparatus. Wagner Electric Corp., St. Louis, Mo.

Editor's Book Table

NEW PUBLICATIONS

"Latex Compounding." Monsanto Chemical Co., Rubber Service Division, Akron, O. 36 pages. Illustrated. This booklet is of interest to all users of latex. Subjects covered include: History of Latex; Compounding Technique; Preparation of Dispersions; Compounding; Wetting Agents and Stabilizers; etc. Test data and formulae are included, based solely on the firm's laboratory experience with its own products.

"Goodrich Products—1939." The B. F. Goodrich Co., Akron, O. 12 pages. This catalog includes a pictorial demonstration of a group of the company's products — tires, tubes, mechanical goods, footwear, etc.—describing their methods of manufacture and illustrating their many possible uses.

"Commodity Exchange, Inc.—Its Functions and Activities." Commodity Exchange, Inc., 81 Broad St., N. Y. 48 pages. The booklet contains a brief historical and statistical summary and much trading information pertaining to each of the seven commodities for which a market is maintained on the Exchange: namely, rubber, silk, hides, copper, lead, zinc, and tin. Hedging on commodity exchanges is discussed in detail, and many examples are given, including rubber, stressing the practical aspects of hedging more than the underlying economic theory. Thus the booklet points out the care with which hedging transactions should be conducted and lists a few popular misconceptions regarding just what they may be expected to accomplish and what should not be expected of them.

Also included is a 12-page pamphlet discussing "Salient Features of the Crude Rubber, Raw Silk, Hides, Copper, Lead, Zinc, and Tin Futures Contracts on Commodity Exchange, Inc."

"The Rubber Index, 1939. Part One, Chemicals, Compounding Ingredients, Etc." *The Rubber Age*, 88/89 Chancery Lane, London W.C.2, England. This 52-page directory refers to rubber chemicals available on the British market and comprises an alphabetical list of manufacturers and suppliers, a group chart giving instant reference to manufacturers and suppliers of ten different groups of compounding ingredients, and six itemized charts giving references to manufacturers and suppliers of chemicals in each of these ten groups. It contains also a list of chemical trade names.

BOOK REVIEWS

"The Principles of Electrochemistry." Duncan A. MacInnes. Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 478 pages. Diagrams, author and subject indexes. Price $6.

This is both a readable and an extremely informative account of electrochemistry, a science mostly concerned with the appearance or disappearance of electrical energy in the surroundings when chemical reactions occur in a system. The basic principles of electrochemistry are discussed and analyzed as to their application; and the foundation thus laid is used as a basis for the introduction of more recent ideas, such as the extension of the Debye-Hückel theory, the application of the interionic attraction theory to electrolytic conductance; and the use of the glass electrode.

An unusual feature of the book is its extensive and critical evaluation of experimental data, not merely abstracted from the literature, but analytically presented and, where necessary, recomputed. On the experimental side there are a very complete presentation of transference numbers and a good account of the much discussed theory and practice of electrophoresis.

"Design of Industrial Exhaust Systems for Dust and Fume Removal." John L. Alden. The Industrial Press, 148 Lafayette St., New York, N. Y. Cloth, 5½ by 8½ inches, 220 pages. Index. Price $3.

In straightforward engineering terms this book tells how to design and build or how to buy an exhaust system that will adequately and economically perform the functions prescribed by law or by the industrial hygiene expert. In the preface the author points out that the literature on this subject is astonishingly scanty, a major contributing factor being the secrecy of those who have accumulated data on exhaust ventilation. In the present volume, the author aims to dispel most of this mystery surrounding exhaust work.

Although the book is essentially practical in nature, it contains sufficient theoretical data to enable an understanding of correct design principles. The subject matter embraces: the theory of air flow, hood and pipe design, the selection of dust collectors, and exhaust fans, structural details, and testing. In addition to covering exhaust ventilation, the book devotes a chapter to low pressure conveyers for the pneumatic transportation of bulk materials which are similar to exhaust systems in design.

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U. S. Rubber

(Continued from page 65)

accident; and Naugatuck Chamical showed an improvement of 98% over the average of its previous three years' experience.

Personnel Changes

The company has named M. P. Lewis, eastern district manager, Wire Sales, to succeed H. H. Weber, who was assistant manager of the Wire Sales Department since 1934, but has now been appointed commercial engineer of the department. C. W. Higbie is manager of the department, which has its headquarters at the company's main office in New York. Assigned to Mr. Lewis's former position is H. J. McDonald, who will continue his headquarters at the Boston, Mass., office.

C. W. Short, development manager of the Bristol R. I., plant of U. S. Rubber for the past two years, has become associated with the sales division of the company.

National Association of Purchasing Agents, 11 Park Place, New York, N. Y., will hold its twenty-fourth annual international convention and Inform-a-Show in San Francisco, Calif., May 22 to 25, 1939.

Federal Trade Commission, Washington, D. C., has announced that Plymouth Rubber Co., Inc., Canton, Mass., manufacturer of rubberized materials including rubber bands, agrees to desist from use in its advertising matter of statements to the effect that its bands are guaranteed to meet Federal Trade Commission or Federal Commission specifications in every detail, when in fact there are no "Federal Trade Commission" or so-called "Federal Commission" standard specifications for products of such character; and from the use of these statements or any other representations of similar meaning which may tend to convey to purchasers the belief that the Federal Trade Commission or any other Commission of the United States Government has adopted, approved, or promulgated standard specifications or requirements for rubber bands, when such is not a fact.

The Seventeenth Exposition of Chemical Industries will be held at Grand Central Palace, New York, N. Y., the week of December 4, 1939. The exposition, now held biennially, this year is completing its twenty-fifth year of service to the chemical and allied industries. To date nearly 200 exhibitors have engaged space, including many who were in the first exposition in 1915.

New York Group

(Continued from page 58)

picture taken on the plantation which traced the production of gutta percha from the gathering of the leaves to the refining step necessary to produce the white product, now used for golf ball covers, from the yellow gutta percha which was formerly used extensively in ocean cables. The early method of destroying the entire tree in order to obtain the latex has been replaced by the practice of collecting the leaves and extracting the gutta percha through a grinding and flotation process, thereby preserving the trees for a continuous supply.

Dr. Ernst A. Hauser discussed "The Vulcanization of Rubber under Stretch," describing the methods employed and results obtained in experiments conducted by himself and I. N. Smith, both of whom are in the Department of Chemical Engineering, Massachusetts Institute of Technology. Utilizing dried films of accelerated latex rubber compounds, a series of cures were carried out while the die-cut marked test pieces were maintained at different degrees of elongation. After the samples were cured, combined-sulphur determinations and physical tests, such as permanent stretch, modulus and tensile strength, were made. Dr. Hauser stated that the results obtained demonstrate that: the samples cured at medium degrees of elongation exhibit a maximum permanent set; the tensile strength drops with increasing degrees of elongation-during-cure; the combined sulphur remains constant and is independent of elongation-during-cure. A discussion of these facts was offered on the basis of intermolecular sulphur bridging at low and medium degrees of elongation-during-cure, and for samples cured at high degrees of elongation the possibility of sulphur adsorption was taken into consideration.

Of great interest was the second part of Dr. Hauser's presentation in which he described the synthetic product, known as "Alsifilm," which is a film derived from aluminum silicate commonly found in many clays. The formation and characteristics of "Alsifilm" can be varied with the composition and method of preparation and it can be combined with other materials including paper. With electrical properties substantially the same as those of sheet mica, these films may be made resistant to water, acids, alkalis, and oils as well as transparent and crease resistant and such as to take printing well.

At the business meeting after the dinner it was voted to sponsor a technical paper contest open to younger members. The resolution prepared by the executive committee and approved by the group reads:

"Whereas: It is the concensus of opinion of the Executive Committee of the New York Rubber Group, A.C.S., that it is desirable to encourage the younger technicians in the area covered by the New York Group to prepare and present instructive papers pertaining to some phase of the rubber industry.

"Be it resolved: That the New York Group sponsor a contest in which may be entered a paper by any member of the group under 35 years of age, for which a fund of $100 be set aside as prize money, the prize paper or papers to be read at the Fall meeting this year. All details of the contest will be formulated by a committee to be appointed by the Chairman and will be published in the trade press."

The group voted unanimously to dispense with the proposed dance in May, but to continue its customary practice of holding a spring outing. The majority of those present favored a New Jersey location. Details as to the time, place, and activities to be expected will be announced later.

Market Reviews

CRUDE RUBBER

New York Quotations

New York outside market rubber quotations in cents per pound

	Mar. 28, 1938	Feb. 24, 1939	Mar. 27, 1939
Plantations			
Rubber latex...*gal.*	49/50	60/61	59/60
Paras			
Upriver fine.....	12¼	13½	13½
Upriver fine.....	*15¾	*16½	*16¼
Upriver coarse...	8¼	10	9½
Upriver coarse...	*13½	*14	*14½
Islands fine	12	14	13¼
Islands fine	*15¼	*15¾	*15½
Acre, Bolivian fine	12½	13¾	13¾
Acre, Bolivian fine	*16	*16½	*16½
Beni, Bolivian fine	13¼	14¾	14½
Madeira fine.....	12¼	14½	13½
Caucho			
Upper ball.....	8½	10	9½
Upper ball.....	*13½	*14	*14½
Lower ball.....	8	9¾	9¾
Pontianak			
Pressed block	13/30	9/14	9/13½
Guayule			
Duro, washed and dried	11¾	13	13
Ampar	12¼	13¼	13¼
Africans			
Rio Nuñez.....	13½	14	14
Black Kassai.....	13½	14	14
Prime Niger flake.	23	25	25
Gutta Percha			
Gutta Siak.....	13½	9½	10
Gutta Soh	17	14	14½
Red Macassar 1.20/2.00		.90/1.20	80/1.20
Balata			
Block, Ciudad Bolivar	29	27	29
Manaos block	27	27	29
Surinam sheets...	32	40	40
Amber	36	42	42

*Washed and dried crepe. Shipments from Brazil.

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES

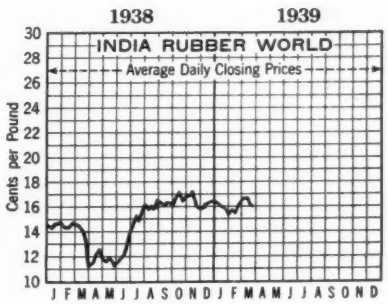
Futures	Jan. 28	Feb. 25	Mar. 4	Mar. 11	Mar. 18	Mar. 25
Feb.	15.35	.....	.....	.....	.....	.....
Mar.	15.40	16.50	16.83	16.67	15.77	16.01
Apr.	.....	16.53	16.82	16.69	15.80	16.01
June	.....	16.56	16.77	16.68	15.82	16.03
July	15.26	16.56	16.73	16.66	15.80	16.04
Sept.	15.29	16.57	16.75	16.66	15.80	16.05
Dec.	15.31	16.58	16.75	16.66	15.80	16.05
Jan.	.....	16.60	16.76	16.66	15.80	16.05
Feb.	.....	.....	16.76	16.66	15.80	16.05
Volume per week (tons)	..22,940	12,440	13,320	6,150	10,310	8,600

THE Commodity Exchange table published here shows prices of representative future contracts on the New York market the last two months.

During the first part of March the rubber market continued the upward trend which began in February following the announcement of the International Rubber Regulation Committee to maintain a 50% export quota figure for the second quarter. At the middle of the month prices broke sharply, reflecting the disturbing political events in Europe. During the decline the rubber market followed closely the securities market here and the foreign rubber markets. After closing at 16.70¢ per pound on March 1, the July future price advanced to 16.74¢ on March 6. Following this the price slumped sharply to reach a low for the month of 15.80¢ on March 18. The decline was halted as conditions abroad became somewhat settled, and the July price moved up to close at 16.10¢ per pound on March 23. The closing price on March 29 was 16.06¢ per pound.

Crude rubber consumption in the United States during February amounted to 42,365 long tons, which was slightly lower than had been generally anticipated. It is currently expected that consumption during March will be in the neighborhood of 46,000 tons which was the approximate figure for January. Details of U. S. imports, consumption, and stocks are given on the following page.

Exports of crude rubber from producing countries participating in the restriction plan exceeded permissible exports in January by approximately 15,000 tons. This was contrary to the general expectation that rubber producers would export less than permissibles to compensate for some of their 1938 overshipments.



New York Outside Market—Spot Ribbed Smoked Sheets

New York Outside Market

Activity in the outside market again

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	February, 1939							March, 1939															
	20	21	22*	23	24	25	27	28	1	2	3	4	6	7	8	9	10	11	13	14	15	16	17	18
No. 1 Ribbed Smoked Sheet	16	16¼	..	16⅜	16½	16⅝	16⅝	16¾	16¾	16⅝	16¾	16⅝	16⅝	16⅝	16⅝	16⅝	16¾	16¾	16⅝	16⅝	16⅝	16⅝	16½	15⅝
No. 1 Thin Latex Crepe...	17⅛	17⅛	..	17⅛	17⅛	18	18	18⅛	17⅞	17⅛	18	18	18	18	18	18	17⅛	17⅛	17¾	17¾	17½	17½	17⅜	17⅛
No. 2 Thick Latex Crepe..	18½	18⅜	..	18⅛	18⅛	18⅞	18⅛	19	19	18¾	18⅛	18⅞	18⅞	18⅞	18⅞	18⅞	18⅛	18⅛	18⅝	18⅝	18⅜	18⅜	18	18
No. 1 Brown Crepe	15⅝	15⅛	..	15⅛	15⅛	16	16	16⅛	16⅛	16⅛	16⅜	16¼	16¼	16¼	16⅜	16⅜	16⅜	16⅛	16⅛	16⅛	15⅞	15⅞	15⅛	15½
No. 2 Brown Crepe.....	15⅜	15⅞	..	15⅞	15⅛	15¾	15⅛	15⅛	15⅛	15⅞	15⅛	16	16	16	16⅛	16⅛	16⅞	16⅞	15⅞	15⅞	15⅝	15⅝	15⅞	15⅛
No. 2 Amber	15⅝	15⅛	..	15⅛	15⅛	16	16⅛	16⅛	16⅛	16⅛	16⅛	16¼	16¼	16¼	16⅜	16⅜	16⅞	16⅞	16⅛	16⅛	15⅞	15⅞	15⅛	15½
No. 3 Amber	15⅜	15⅞	..	15⅞	15⅛	15¾	15⅛	15⅛	15⅛	15⅞	15⅛	16	16	16	16⅛	16⅛	16⅞	16⅞	15⅞	15⅞	15⅝	15⅝	15⅞	15¼
Rolled Brown	14⅞	14⅛	..	14¼	14⅜	14⅞	14⅜	14⅝	14⅝	14⅞	14⅝	14⅛	14⅛	14⅛	14⅜	14⅜	14⅞	14⅞	14⅛	14⅛	13⅞	13⅞	13⅛	13½

* Holiday

New York Outside Market (Continued)

	March, 1939					
	20	21	22	23	24	25
No. 1 Ribbed Smoked Sheet.....	15⅛	15⅛	15⅜	16⅛	16⅛	16⅞
No. 1 Thin Latex Crepe.....	17⅛	17⅛	17⅞	17¼	17⅛	17⅞
No. 2 Thick Latex Crepe.....	18	18	17⅛	18⅛	18⅛	18⅞
No. 1 Brown Crepe.....	15⅛	15⅛	15⅞	15¾	15¾	15⅛
No. 2 Brown Crepe.....	15¼	15¼	15⅞	15⅝	15⅝	15⅞
No. 2 Amber	15⅛	15⅛	15⅞	15¾	15¾	15⅛
No. 3 Amber	15¼	15¼	15⅛	15⅝	15⅝	15⅛
Rolled Brown	13½	13½	13⅞	14⅜	14⅜	14⅛

Toy Balloon Crosses Atlantic

In the March issue of *The Oakleaf*, published by The Oak Rubber Co., Ravenna, O., is included a letter from S. Duits & Co., Dordrecht, Holland, to the Ravenna company which quoted a recent article in the newspaper, *Dordretsche Nieuwsblad*.

The essence of the article is that an Oak Rubber Co. toy balloon filled with gas and tagged with a return address card had been released in a contest by a child at Zandvoort, Holland, with the result that a lady in New Jersey, U. S. A., found the balloon and returned the addressed card to the sender of the balloon in Holland.

ruled generally quiet during March. A fair amount of factory and shipment business was reported at intervals, but there was no evidence of sustained buying. Shipment offerings from the Far East continued to be generally too high for the local market. At the middle of the month a fair amount of purchasing was said to originate from some of the larger tire manufacturers. Off grades which showed a tendency to narrow in price were in fair demand by factories.

Closing at 16¾¢ per pound on March 1, the price of No. 1 ribbed smoked sheets held generally steady until March 9 when it closed at 16⅛¢ per pound. Following this the price dropped sharply in company with the futures market to close at 15⅞¢ per pound on March 22. On the next day the price rallied, closing at 16⅛¢. On March 29 the closing price was 16⅛¢ per pound.

The week-end closing prices on No. 1 ribbed smoked sheets follow: March 4, 16⅛¢; March 11, 16¾¢; March 18, 15⅛¢; and March 25, 16⅛¢.

IMPORTS, CONSUMPTION AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption‖ Tons	U. S. Stocks Mfgrs., Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat† Tons	U. K.—Public Warehouses, London Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡§ Tons
1936	490,858	575,000	223,000	56,567	78,462	26,969	855,600	1,044,695	538,028
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,135,300	1,103,591	639,025
1938	400.178	411,363	245,413	45,105	86,853	27,084	889,404	917,281	586,618
1938									
Jan.	42,135	29,429	274,581	57,356	62,108	48,494	80,374	68,697	a634,330
Feb.	43,930	23,868	294,338	47,459	71,516	46,241	80,969	63,152	a653,791
Mar.	35,967	30,487	299,172	41,882	76,617	50,797	81,173	78,259	a670,332
Apr.	30,807	27,984	301,436	39,071	82,754	40,614	86,725	70,284	a668,440
May	27,410	28,947	299,720	32,859	87,215	40,598	64,406	76,980	a653,865
June	26,011	30,629	294,566	32,079	92,312	44,729	70,870	70,761	a670,068
July	22,918	32,209	284,914	40,400	95,252	45,529	79,736	72,089	a670,873
Aug.	31,099	38,170	277,463	47,772	99,614	41,002	74,551	73,465	a654,704
Sept.	37,374	37,823	276,586	48,927	98,140	35,386	70,895	77,838	a646,378
Oct.	34,496	40,333	269,937	51,062	93,272	34,901	75,023	85,899	a634,580
Nov.	31,054	46,169	254,196	51,114	90,073	31,255	66,998	91,788	a604,271
Dec.	36,977	45,315	245,413	45,105	86,853	27,084	57,684	88,069	a586,618
1939									
Jan.	39,082	46,234	237,826	48,210	80,643	30,975	86,518	88,809	.....
Feb.	36,490	42,365	231,475	55,814	.....	.....	.....	.....	.....

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ‖Corrected to 100% from estimate of reported coverage. *a* Japan stocks not included.

U. S. Crude and Waste Rubber Imports for 1939

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1939	Totals 1938	Miscellaneous Balata	Miscellaneous	Waste
Jan. .....*tons*	36,672	1,521	560	56	9	264	39,082	42,135	61	803	328
Feb.	34,185	1,463	239	348	3	252	36,490	43,930	45	685	54
Total 2 mos., 1939 .....*tons*	70,857	2,984	799	404	12	516	75,572	.....	106	1,488	382
Total 2 mos., 1938 .....*tons*	81,453	2,659	864	327	6	756	.....	86,065	76	1,334	30

Compiled from The Rubber Manufacturers Association, Inc., statistics.

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1937	185,033	162,000	29.8	28,800	13,233
1938	113,482	113,341	27.6	21,769	7,407
1939					
Jan.	13,763	13,000	28.1	21,960	748
Feb.	13,093	12,626	30.9	21,390	....

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage. *Compiled by The Rubber Manufacturers Association, Inc.*

ACCORDING to R. M. A. statistics, February reclaimed rubber consumption is estimated at 12,626 long tons, 2.9% below that of January; production at 13,093 long tons; and stocks on hand February 28, 21,390 long tons.

Reclaimers are fairly active, and the demand during March was reported to be slightly greater than that of the preceding month. Greatest demand for reclaim is currently originating from tire and mechanical goods manufacture. A further improvement in business is anticipated for April.

The market continues steady, and all grades of reclaim remain unchanged at prices that have been in effect since the first of the year.

New York Quotations

March 24, 1939

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
No. 1 Floating	1.00	12 /12¼
Compound	1.10-1.20	8 / 8¼
Red Tube	1.15-1.30	8 / 8¼
Miscellaneous		
Mechanical Blends ...	1.25-1.50	4½/ 5
White	1.35-1.50	11½/12

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

CRUDE rubber consumption by United States manufacturers during February is estimated at 42,365 long tons, against 46,234 long tons during January, 8.4% under January, but 77.5% over the 23,868 long tons consumed in February, 1938, according to R.M.A. statistics.

Gross imports of crude rubber for February are reported to be 36,490 long tons, 6.6% under the January figure of 39,082 long tons and 16.9% under the 43,930 long tons imported in February, 1938.

Domestic stocks of crude rubber on hand February 28 total 231,475 long tons, against January 31 stocks of 237,826 long tons and 294,338 long tons on hand February 28, 1938.

Crude rubber afloat to United States ports as of February 28 is estimated at 55,814 long tons against 48,210 long tons afloat on January 31 and 47,459 long tons afloat on February 28, 1938.

London and Liverpool Stocks

Ended	London (Tons)	Liverpool (Tons)
February 25	48,489	26,280
March 4	47,988	26,489
March 11	47,442	26,068
March 18	47,319	25,799
March 25	47,216	25,723

"Second Trade Agreement Between the United States and Canada." Vol. 4. United States Tariff Commission, Washington, D. C. This volume consists of digests of information concerning products on which concessions were granted by the United States in the trade agreement with Canada. Of interest to the rubber trade is the paragraph on Rubber Hose & Tubing, page 23, Schedule XV, in this volume.

COMPOUNDING INGREDIENTS

COMPOUNDING ingredients were in slightly better demand during the past month. The higher rate of activity evident throughout the first quarter is expected to hold for some time unless unforeseen or disturbing developments occur. A broadening of activity in the rubber industry will depend largely on the general business trend and activity in the automotive industry. Prices in general continue steady and unchanged at last month's levels.

CARBON BLACK. Movement of carbon black into consuming channels during March continued in good volume. Consumption by rubber manufacturers maintained a fairly high level, which is expected to hold during the coming month. There has been no indication of a change in the price structure which continues at the low level established some time back.

FACTICE OR RUBBER SUBSTITUTES. The demand continues fair with prices holding steady.

LITHARGE. Sales of this pigment, which had been slow, improved toward the latter part of the month. The price continued firm and unchanged.

LITHOPONE. An increase in the activity of this product during March improved its market position. No price changes were made.

RUBBER CHEMICALS. The demand for rubber chemicals last month continued at a level comparable with that of the past several months. A somewhat improved activity is anticipated for April. The market continues generally steady with no substantial price changes noted.

RUBBER SOLVENTS. During March the market held the increased activity reported a month ago. Prices remain steady and unchanged.

STEARIC ACID. While no general broadening of activity was reported, the movement of acid into consumption was at a fair rate, and buying interest showed signs of stimulation. Quotations hold at former levels.

TITANIUM PIGMENTS. Toward the latter part of March substantial increases in sales were reported by producers. A further increase in activity is expected during the next few weeks. All prices continue firm at previously quoted levels.

ZINC OXIDE. Consumption of zinc oxide in the rubber industry showed further improvement. With the demand from the paint, and linoleum industries also more active, the market has become firm. Prices continue unchanged.

New York Quotations

March 24, 1939

Prices Not Reported Will Be Supplied on Application

Abrasives			
Pumicestone, powdered	*lb.*	$0.03	/$0.035
Rottenstone, domestic	*lb.*	.03	/ .035
Silica, 15	*ton*	38.00	
Accelerators, Inorganic			
Lime, hydrated, l.c.l., New York	*ton*	20.00	
Litharge (commercial)	*lb.*	.0675/	.0725
Accelerators, Organic			
A-1	*lb.*	.24	
A-10	*lb.*	.35	/ .40
A-11	*lb.*	.52	/ .65
A-19	*lb.*	.52	/ .65
A-32	*lb.*	.70	/ .80
A-77	*lb.*	.42	/ .55
A-100	*lb.*	.42	/ .55
Accelerator 49	*lb.*	.42	
737	*lb.*	.42	/ .43
737-50	*lb.*	.25	/ .26
808	*lb.*	.70	/ .72
833	*lb.*	1.15	
Acrin	*lb.*	.60	
Aldehyde ammonia	*lb.*	.70	
Altax	*lb.*	.55	/ .70
B-J-F	*lb.*	.50	/ .55
Beutene	*lb.*	.70	/ .75
Butyl Zimate	*lb.*	2.65	
C-P-B	*lb.*	2.00	
Captax	*lb.*	.50	/ .60
Crylene	*lb.*	.40	/ .47
Paste	*lb.*	.30	/ .36
D-B-A	*lb.*	2.00	
Di-Esterex	*lb.*	.60	/ .70
N	*lb.*	.60	/ .70
DOTG (Di-ortho-tolylguanidine)	*lb.*	.44	/ .46
DPG (Diphenylguanidine)	*lb.*	.35	/ .45
El-Sixty	*lb.*	.50	/ .65
Ethylideneaniline	*lb.*	.42	/ .43
Ethyl Zimate	*lb.*	2.65	
Formaldehyde P.A.C.	*lb.*	.0625	
Formaldehydeaniline	*lb.*	.31	
Formaldehyde-para-toluidine	*lb.*	.52	/ .54
Guantal	*lb.*	.40	/ .50
Hepteen	*lb.*	.35	/ .40
Base	*lb.*	1.35	/ 1.50
Hexamethylenetetramine U.S.P.	*lb.*	.39	
Technical	*lb.*	.33	
Lead oleate, No. 999	*lb.*	.13	
Witco	*lb.*	.15	
Monex	*lb.*	2.65	
Novex	*lb.*		
O. N. V.	*lb.*	1.00	/ 1.10
O-X-A-F	*lb.*	.50	/ .55
Ovac	*lb.*	.50	/ .55
Para-nitroso-dimethylaniline	*lb.*	.85	
Pentex	*lb.*	1.00	/ 1.10
Pentex Flour	*lb.*	.15	/ .16
Pip-Pip	*lb.*	2.50	
Pipsolene	*lb.*	1.55	/ 1.85
R-2	*lb.*	$1.40	/$1.80
R-23	*lb.*	.40	
R & H 50-D	*lb.*	.42	/ .43
Rotax	*lb.*	.60	/ .65
Safex	*lb.*	1.20	/ 1.30
Santocure	*lb.*	.80	/ 1.00
Super-sulphur No. 1	*lb.*	.50	
2	*lb.*	.18	/ .25
Tetrone A.	*lb.*	3.00	
Thiocarbanilide	*lb.*	.24	/ .30
Thionex	*lb.*	2.65	
Trimene	*lb.*	.55	/ .65
Base	*lb.*	1.05	/ 1.20
Triphenylguanidine (TPG)	*lb.*	.45	
Tuads	*lb.*	2.65	
Ureka	*lb.*	.60	/ .75
Blend B	*lb.*	.60	/ .75
C	*lb.*	.56	/ .65
Vulcanex	*lb.*	.42	/ .43
Vulcanol	*lb.*	.85	
Z-B-X	*lb.*	2.50	
Z-88-P	*lb.*	.51	
Zenite	*lb.*	.46	/ .48
A	*lb.*	.53	/ .55
B	*lb.*	.46	/ .48
Zimate	*lb.*	2.65	
Activator			
Aero Ac 50	*lb.*		
Barak	*lb.*	.50	
Age Resisters			
AgeRite Alba	*lb.*	1.50	/ 2.00
Excl	*lb.*	1.00	/ 1.40
Gel	*lb.*	.57	/ .75
Hipar	*lb.*	.65	/ .92
Powder	*lb.*	.52	/ .65
Resin	*lb.*	.52	/ .65
D	*lb.*	.52	/ .65
White	*lb.*	1.25	/ 1.65
Akroflex C	*lb.*	.56	/ .58
Albasan	*lb.*	.70	/ .75
Aminox	*lb.*	.52	/ .61
Antox	*lb.*	.56	
B-L-E	*lb.*	.52	/ .61
Powder	*lb.*	.65	/ .74
B-X-A	*lb.*	.55	/ .61
Copper Inhibitor X-872	*lb.*	1.15	
Flectol B.	*lb.*	.52	/ .65
H	*lb.*	.52	/ .65
White	*lb.*	.90	/ 1.15
M-U-P	*lb.*	1.50	
Neozone (standard)	*lb.*	.63	
A	*lb.*	.52	/ .54
B	*lb.*	.63	
C	*lb.*	.52	/ .54
D	*lb.*	.52	/ .54
E	*lb.*	.63	
Oxynone	*lb.*	.64	/ .80
Parazone	*lb.*	.68	
Permalux	*lb.*	1.20	
Santoflex B	*lb.*	.52	/ .65
Solux	*lb.*	1.30	
Thermoflex A	*lb.*	.65	/ .67
V-G-B	*lb.*	.52	/ .61
Alkalies			
Caustic soda, flake, Columbia (400 lb. drums)	*100 lbs.*	$2.70	/$3.55
liquid, 50%	*100 lbs.*	1.95	
solid (700 lb. drums)	*100 lbs.*	2.30	/ 3.15
Antiscorch Materials			
A-F-B	*lb.*	.35	/ .40
Antiscorch T	*lb.*	.90	
E-S-E-N	*lb.*	.35	/ .40
R-17 Resin (drums)	*lb.*	.10	
RM	*lb.*	1.25	
Retarder W	*lb.*	.36	
U.T.B.	*lb.*	.35	/ .40
Antisun Materials			
Heliozone	*lb.*	.23	
Sunproof	*lb.*	.23	/ .25
Colors			
BLACK			
Du Pont powder	*lb.*	.42	/ .44
Lampblack (commercial)	*lb.*	.15	
BLUE			
Brilliant	*lb.*		
Du Pont dispersed	*lb.*	.83	/ 3.60
Powders	*lb.*	2.25	/ 3.75
Prussian	*lb.*	.0375	
Toners	*lb.*	.08	/ 3.85
BROWN			
Mapico	*lb.*	.11	
GREEN			
Brilliant	*lb.*		
Chrome, light	*lb.*		
medium	*lb.*	.22	
oxide (freight allowed)	*lb.*		
Dark	*lb.*		
Du Pont dispersed	*lb.*	.98	/ 1.75
Powders	*lb.*	1.00	/ 2.00
Guignet's, Easton, Pa., bbls.	*lb.*	.70	
Light	*lb.*		
Toners	*lb.*	.85	/ 3.75
ORANGE			
Du Pont dispersed	*lb.*	.88	/ .90
Powders	*lb.*	.80	/ 2.50
Lake	*lb.*		
Toners	*lb.*	.40	/ 1.60
ORCHID			
Toners	*lb.*	1.50	/ 2.00
PINK			
Toners	*lb*	1.50	/ 2.00
PURPLE			
Permanent	*lb.*		
Toners	*lb.*	.60	/ 2.10
RED			
Antimony			
Crimson, 15/17%	*lb.*	.45	
R. M. P. No. 3	*lb.*	.48	
Sulphur free	*lb.*	.50	
R.M.P.	*lb.*	.52	
Golden 15/17%	*lb.*	.28	
7-A	*lb.*	.37	
Z-2	*lb.*	.23	

RED—(Cont'd)

Aristi	lb.	$1.75	
Cadmium, light (400 lb. bbls.)	lb.	.70	/$0.75
Chinese	lb.		
Crimson	lb.		
Du Pont dispersed	lb.	.93	/ 2.05
Powders	lb.	.52	/ 1.05
Mapico	lb.	.0925	
Medium	lb.		
Rub-Er-Red, Easton, Pa., bbls.	lb.	.0925	
Scarlet	lb.		
Toners	lb.	.08	/ 2.00

WHITE

Lithopone (bags)	lb.	.04½/	.04⅝
Albalith Black Label-11	lb.	.04½/	.04⅝
Astrolith	lb.	.04½/	.04⅝
Azolith	lb.	.04½/	.04⅝
Cryptone-BA-19	lb.	.05⅝/	.05⅞
BT	lb.	.05⅝/	.05⅞
CB	lb.	.05⅝/	.05⅞
ZS No. 20	lb.	.07⅜/	.08⅛
86	lb.	.07⅜/	.08⅛
230	lb.	.07⅜/	.08⅛
Sunolith	lb.	.04½/	.04⅝
Ray-Bar	lb.	.05⅜/	.06⅛
Ray-Cal	lb.	.05⅜/	.06⅛
Rayox	lb.	.14	/ .17
Titanolith (5-ton lots)	lb.	.05⅝/	.05⅞
Titanox-A (50-lb. bags)	lb.	.14	/ .14¾
B (50-lb. bags)	lb.	.05⅝/	.05⅞
30 (50-lb. bags)	lb.	.05⅝/	.05⅞
C (50-lb. bags)	lb.	.05⅝/	.05⅞
M	lb.	.05⅝/	.05⅞
Ti-Tone	lb.		
Zinc Oxide			
Azo ZZZ-11	lb.	.0625/	.065
44	lb.	.0625/	.065
55	lb.	.0625/	.065
66	lb.	.0625/	.065
French Process, Florence			
White Seal-7 (bbls.)	lb.	.085	/ .0875
Green Seal-8	lb.	.08	/ .0825
Red Seal-9	lb.	.075	/ .0775
Kadox, Black Label-15	lb.	.065	/ .0675
No. 25	lb.	.075	/ .0775
Red Label-17	lb.	.065	/ .0675
Horse Head Special 3	lb.	.0625/	.065
XX Red-4	lb.	.0625/	.065
23	lb.	.0625/	.065
72	lb.	.0625/	.065
78	lb.	.0625/	.065
80	lb.	.0625/	.065
103	lb.	.0625/	.065
110	lb.	.0625/	.065
St. Joe (lead free)			
Black Label	lb.	.0625/	.065
Green Label	lb.	.0625/	.065
Red Label	lb.	.0625/	.065
U.S.P.	lb.	.095	/ .0975
White Jack	lb.	.07⅞/	.08⅛
Zopaque	lb.	.14	/ .1475

YELLOW

Cadmolith (cadmium yellow), 400 lb. bbls.	lb.	.45	/ .50
Du Pont dispersed	lb.	1.25	/ 1.75
Powders	lb.	1.55	/ 1.37
Lemon	lb.		
Mapico	lb.	.0675	
Toners	lb.	2.50	

Dispersing Agents

Darvan	lb.	.30	/ .47
Nevoll (drums)	lb.	.0215	
Santomerse S	lb.	.11	/ .25

Fillers, Inert

Asbestine, c.l., f.o.b., mills	ton	15.00	
Barytes	ton	30.00	/36.00
f.o.b., St. Louis (50 lb. paper bags)	ton	22.85	
off color, domestic	ton	20.00	/25.00
white, imported	ton	29.00	/32.00
Blanc fixe, dry, precip.	lb.	.03	/ .035
Calcene	ton	37.50	/43.00
Infusorial earth	lb.	.02	/ .03
Kalite No. 1	ton	24.00	/50.00
3	ton	34.00	/60.00
Magnesia, calcined, heavy	lb.	.04	
Carbonate, l.c.l.	lb.	.07	/ .095
Pyrax A	ton	6.50	/20.00
Whiting			
Columbia Filler	ton	9.00	/14.00
Guilders	100 lbs.		
Hakuenka	lb.		
Paris white, English cliff-stone	100 lbs.		
Southwark Brand, Commercial	100 lbs.		
All other grades	100 lbs.		
Suprex, white extra light	ton	45.00	/60.00
heavy	ton	45.00	/ 60.00
Witco, c.l.	ton	6.00	

Finishes

Rubber lacquer, clear	gal.		
colored	gal.		
Starch, corn, pwd.	100 lbs.		
potato	lb.		
Talc	ton	25.00	/45.00

Flock

Cotton flock, dark	lb.	$0.10	/$0.13
dyed	lb.	.40	/ .85
white	lb.	.13	/ .19
Rayon flock, colored	lb.	1.10	/ 2.00
white	lb.	.75	/ 1.00

Latex Compounding Ingredients

Accelerator 85	lb.	.35	
89	lb.	1.40	
122	lb.	1.55	
552	lb.	2.50	
Aerosol	lb.	.45	
Antox, Dispersed	lb.	.42	
Aquarex A	lb.	.35	
D	lb.	.75	
F	lb.	.85	
WA Paste	lb.	.25	
Areskap No. 50	lb.	.18	/ .24
100, dry	lb.	.39	/ .51
Aresket No. 240	lb.	.16	/ .22
300, dry	lb.	.42	/ .50
Aresklene No. 375	lb.	.35	/ .50
400, dry	lb.	.51	/ .65
Black No. 25, Dispersed	lb.	.22	/ .40
Catalpo	ton		
Collocarb	lb.	.055	/ .07
Color Pastes, Dispersed	lb.	.35	/ 1.90
Dispersex No. 15	lb.	.11	/ .12
No. 20	lb.	.08	/ .10
Emo, brown	lb.	.15	
white	lb.	.15	
Factice Compound, Dispersed	lb.	.36	
Heliozone, Dispersed	lb.	.25	
Igepon A	lb.		
MICRONEX, Colloidal	lb.	.055	/ .07
Nekal BX (dry)	lb.		
Palmol	lb.	.11	
Pipsol X	lb.	3.05	/ 3.55
R-23	lb.	.57	
RN-2	lb.	1.40	/ 1.80
S.1 (400 lb. drums)	lb.	.65	
Santomerse D	lb.	.41	/ .65
S	lb.	.11	/ .25
No. 1	lb.	.18	/ .35
No. 2	lb.	.18	/ .35
No. 3	lb.	.40	/ .65
No. 3P	lb.	.29	/ .45
Santovar A	lb.	1.15	/ 1.40
Stablex A	lb.	.90	/ 1.10
B	lb.	.65	/ .90
C	lb.	.40	/ .50
Sulphur, Dispersed	lb.	.10	/ .15
No. 2	lb.	.075	/ .15
T.1. (400 lb. drums)	lb.	.40	
Tepidone	lb.	1.55	
Vulcan Colors	lb.		
Zinc oxide, Dispersed	lb.	.12	/ .15

Mineral Rubber

Black Diamond	ton	25.00	
Hydrocarbon, hard	ton	22.00	/42.00
Parmr	ton	22.00	/24.00
Pioneer	ton		
285°-300°	ton	22.00	/42.00

Mold Lubricants

Mold Paste	lb.	.12	/ .18
Sericite	ton	65.00	/75.00
Soapbark	lb.		
Soapstone	ton	25.00	/35.00

Oil Resistant

AXF	lb.	.40	/ .50

Reenforcers

Carbon Black			
Aerfloted Arrow Specification Black	lb.	.0275/	.0625
Arrow Compact Granulized Carbon Black	lb.	.0275/	.0625
"Certified" Heavy Compressed, Cabot	lb.		
Sphéron	lb.		
Carbitum	ton	58.00	/63.00
Continental Dustless, c.l.	lb.	.0275/	.0375
Compressed c.l.	lb.	.0275/	.0375
Uncompressed, c.l.	lb.	.0275/	.0375
Disperso, c.l.	lb.	.0275/	.0375
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Dixiedensed, 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Excello, c.l., f.o.b Gulf ports	lb.	.0275/	.0475
delivered New York	lb.	.0375/	.0575
l.c.l., delivered New York	lb.	.0625/	.07
Fumonex, c.l., f.o.b. works	lb.	.03	
ex-warehouse	lb.	.05	
Gastex	lb.	$0.03	/$0.07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Kosmobile 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275	
c.l., delivered New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
MICRONEX Beads, c.l., f.o.b. Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Mark II, c.l., f.o.b Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Standard, c.l., f.o.b. Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
W-5, c.l., f.o.b., Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
W-6, c.l., f.o.b., Gulf ports	lb.	.0275	
c.l., delivered, New York	lb.	.0375	
local stock, bags, delivered	lb.	.0625	
Paradene No. 2 (drums)	lb.	.04	
Pelletex	lb.	.03	/ .07
Supreme, c.l., f.o.b. Gulf ports	lb.	.0275/	.0475
delivered New York	lb.	.0375/	.0575
l.c.l., delivered New York	lb.	.0625/	.07
"WYEX BLACK"	lb.	.0275/	.0625

Clays

Aerfloted Paragon (50 lb. bags)	ton	9.50	/22.00
Suprex (50 lb. bags)	ton	9.50	/22.00
China	ton	17.50	/20.00
Dixie	ton	11.00	/26.00
Junior	ton	9.50	/24.00
Hi-White, f.o.b. Huber Ga.	ton	9.50	
McNamee	ton	9.50	/22.00
Par	ton	9.50	/22.00
Witco, f.o.b. works	ton	9.50	
P-33	lb.	.0475/	.0775
Thermax	lb.	.0175/	.05
Velvetex	lb.	.022	/ .035

Reodorants

Amora A	lb.		
B	lb.		
C	lb.		
D	lb.		
Curodex 19	lb.	2.75	
188	lb.	3.50	
198	lb.	4.50	
Rodo No. 0	lb.	3.50	/ 4.00
10	lb.	4.50	/ 5.00

Rubber Substitutes

Black	lb.	.07	/ .11
Brown	lb.	.07	/ .10
White	lb.	.08	/ .11½

Factice

Amberex	lb.	.19	
Brown	lb.	.07	/ .10
Fac-Cel B	lb.	.12	
C	lb.	.12	
Neophax A	lb.	.0975	
B	lb.	.0975	
White	lb.	.08	/ .11

Softeners

Bondogen	lb.	.98	/ 1.50
Burgundy pitch	lb.	.06	
Cycline oil	gal.	.14	/ .20
Nuba resinous pitch (drums)			
Grades No. 1 and No. 2	lb.	.0265	
Nubalene Resin	lb.	.025	
Palm oil (Witco), c.l.	lb.	.0575	
Pine tar	gal.		
Plastogen	lb.	.0775/	.12
R-19 Resin (drums)	lb.	.10	
R-21 Resin (drums)	lb.	.10	
Reogen	lb.	.115	/ .26
Rosin oil, compounded	gal.	.40	

(Continued on page 88)

Adamson mixing and moulding equipment, for the Rubber, Bakelite, Plastic, and allied industries, is built to meet modern production demands for greater accuracy, and lower cost. Every unit represents a background of investigation and factory experience that guarantees efficient operation and mechanical perfection.

RUBBER EQUIPMENT

AMCO ESTABLISHED 1892

The ADAMSON MACHINE Co.
AKRON » » » OHIO

The H. O. Canfield Co.
MANUFACTURE
Molded Specialties, Plumbers' Rubber Goods, Valves, Gaskets, Hose Washers, and Cut Washers of all kinds
Write for prices and samples
Offices and Works Bridgeport, Conn.
Chicago Office: 424 North Wood Street

MOLDS
WE SPECIALIZE IN MOLDS FOR
Heels, Soles, Slabs, Mats, Tiling and Mechanical Goods
MANUFACTURED FROM SELECTED HIGH GRADE STEEL BY TRAINED CRAFTSMEN, INSURING ACCURACY AND FINISH TO YOUR SPECIFICATIONS. PROMPT SERVICE.
LEVI C. WADE CO.
79 BENNETT ST. LYNN, MASS.

FINELY PULVERIZED—BRILLIANT
COLORS
for RUBBER
Chicago Representative FRED L. BROOKE 228 N. La Salle St.
Pacific Coast Representative MARSHALL DILL San Francisco
Cleveland, PALMER-SCHUSTER CO., 975-981 Front St.
Manufactured by
BROOKLYN COLOR WORKS, INC.
Morgan and Norman Avenues Brooklyn, N. Y.

Regular and Special Constructions
of
COTTON FABRICS
Single Filling Double Filling
and
ARMY
Ducks
HOSE and BELTING
Ducks
Drills
Selected
Osnaburgs
Curran & Barry
320 BROADWAY
NEW YORK

COTTON AND FABRICS

New York Quotations

March 23, 1939

Drills		
38-inch 2.00-yard	yd.	$0.10½
40-inch 3.47-yard		.06½
50-inch 1.52-yard		.15⅛
52-inch 1.85-yard		.12¾
52-inch 1.90-yard		.11¾
52-inch 2.20-yard		.10¾
52-inch 2.50-yard		.09½
59-inch 1.85-yard		.12
Ducks		
38-inch 2.00-yard D.F.	yd.	.10 /.10¾
40-inch 1.45-yard S. F.		.15½
51½-inch 1.35-yard D. F.		.14¾
72-inch 1.05-yard D. F.		.21
72-inch 17.21-ounce		.24
Mechanicals		
Hose and belting	lb.	.24½
Tennis		
52-inch 1.35-yard	yd.	.16½
Hollands		
Gold Seal and Eagle		
20-inch No. 72	yd.	.09
30-inch No. 72		.16
40-inch No. 72		.18
Red Seal and Cardinal		
20-inch	yd.	.07½
30-inch		.13¾
40-inch		.15
50-inch		.24
Osnaburgs		
40-inch 2.34-yard	yd.	.09⅛
40-inch 2.48-yard		.08¾
40-inch 2.56-yard		.07
40-inch 3.00-yard		.07¼
40-inch 7-ounce part waste		.07
40-inch 10-ounce part waste		.10
37-inch 2.42-yard		.08⅞
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64	yd.	.07
Plaids 60 x 48		.10¾
Surface prints 60 x 64		.11½
Print cloth, 38½-inch, 60 x 64		.04¼
Sheetings, 40-Inch		
48 x 48, 2.50-yard	yd.	.06¾
64 x 68, 3.15-yard		.06½
56 x 60, 3.60-yard		.05½
44 x 40, 4.25-yard		.04¾
Sheetings, 36-Inch		
48 x 48, 5.00-yard	yd.	.04
44 x 40, 6.15-yard		.03⅝
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.27
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.27
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.26
Cord Fabrics		
23/5/3 Karded peeler, 1/16" cotton	lb.	.27½
15/3/3 Karded peeler, 1/16" cotton	lb.	.25½
23/5/3 Karded peeler, 1¼" cotton	lb.	.33
23/5/3 Combed Egyptian	lb.	.46½
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.29

New York Cotton Exchange Week-End Closing Prices

	Jan. 28	Feb. 25	Mar. 4	Mar. 11	Mar. 18	Mar. 25
Feb.	8.38	....	....	....	....	....
Mar.	8.40	8.55	8.71	8.76	....	....
Apr.	....	8.36	8.52	8.56	8.25	8.17
June	....	8.04	8.22	8.26	8.15	8.05
July	7.81	7.91	8.11	8.16	8.05	7.93
Sept.	7.42	7.51	7.64	7.69	7.76	7.58
Dec.	7.40	7.44	7.61	7.65	7.71	7.52
Jan.	7.41	7.42	7.61	7.64	7.71	7.52
Feb.	....	....	....	....	7.73	7.53

THE accompanying table of week-end closing prices on the New York Cotton Exchange shows the week-end change of representative futures covering the past two months.

The New York spot middling price closed at 8.67¢ per pound on March 1. Prices moved rather widely during the first three weeks of the past month, closing with a high of 8.80¢ on March 6 and a low of 8.54¢ on March 18. The closing price on March 29 was 8.83¢ per pound.

Sales at 13 southern markets totaled 104,130 bales during 17 days since March 1, against 135,760 bales for the same days one year ago.

Consumption of all cotton in domestic mills during February totaled 562,293 bales, against 591,991 in January and 426,866 in February last year, according to the Census Bureau.

On March 9 the Senate Agriculture Committee voted approval of the Smith Cotton Bill, which directs the Secretary of Agriculture to pay a subsidy of up to 5¢ a pound to cotton growers to discourage placing of additional supplies of cotton under Government loan, and permits growers to repossess loan stocks at the rate of 3¢ a pound for voluntary reductions in production below allotments.

A proposed export plan, backed by the Administration and designed to move a considerable volume of loan cotton into foreign trade, met with strong opposition from the cotton trade both in this country and abroad. The proposed action and the uncertainty regarding the outcome of other cotton legislation adversely affected trading in cotton.

Fabrics

The market for cotton textiles of coarse yarn construction was generally quiet during the past month, with buying hesitancy attributable to uncertain conditions both here and abroad. Proposed cotton legislation is still causing considerable concern. Inventories have been steadily reduced, and there has been some curtailment of production. After an active period during early March the sheeting market resumed its previous dullness. The spring raincoat season is now under way, and manufacturers of these fabrics anticipate an increase in business as soon as the weather becomes warmer.

The market was generally steady with only minor price variations being registered. Certain grades of ducks and osnaburgs were reduced slightly; while several grades of raincoat fabrics and sheetings showed fractional changes. Other fabrics held steady at last month's quotations.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for February, 1939:

Rubber Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham.

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	6,200	570
United States	20,378	754
Continent of Europe	7,575	324
British possessions	3,268	10
Japan	2,828	14
Other countries	1,131	32
Totals	41,380	1,704

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	4,368	102
Dutch Borneo	747	...
Java and other Dutch islands	135	...
Sarawak	1,237	8
British Borneo	232	10
Burma	519	...
Siam	4,100	1,499
French Indo-China	684	150
Other countries	98	...
Totals	12,120	1,769

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.†	Australia	Belgium	Canada	Czecho-Slovakia	France	Germany	Italy	Japan	Russia	Rest of the World	Total
1936	475,500	62,700	14,400	9,600	27,900	8,800	56,800	71,800	16,000	61,700	31,000	65,100	831,800
1937	592,500	137,300	19,300	15,000	36,100	13,000	60,000	98,200	24,000	62,200	30,400	77,400	1,120,500
1938	406,342	169,201	12,309	11,310	25,696	9,936	58,144	90,200	28,170	46,307	25,649*	83,041	930,182
1938													
Jan.	45,596	17,811	617	1,258	1,789	1,102	4,780	6,314	1,809	4,935	693	6,264	90,615
Feb.	40,977	19,149	621	974	615	1,771	5,420	6,959	2,000	3,173	2,341	5,958	87,314
Mar.	42,075	18,134	1,084	961	2,123	1,323	4,823	10,768	1,365	6,222	2,162	6,332	95,150
Apr.	31,870	16,572	647	904	999	920	5,721	6,497	2,397	5,456	4,281	6,220	80,565
May	27,809	17,783	1,087	1,137	2,545	957	5,249	9,595	2,422	3,328	4,163	7,290	80,257
June	26,429	15,314	825	853	3,243	988	4,552	7,478	2,399	2,156	504	7,109	70,589
July	22,209	13,555	1,251	1,106	2,685	636	4,545	6,927	3,641	3,100	541	6,623	65,939
Aug.	31,493	14 925	1,444	1,238	1,832	595	3,560	7,190	2,078	2,034	739	6,106	71,200
Sept.	34,436	11,218	1,588	519	1,405	608	5,072	7,390	1,799	3,586	1,735	7,116	73,344
Oct.	33,830	7,632	1,800	848	3,139	9	3,804	6,326	3,921	3,206	2,000*	10,756	72,723
Nov.	32,567	8,657	671	636	3,123	379	5,226	7,275	1,984	4,665	4,000*	7,122	68,584
Dec.	37,051	8,451	674	876	2,198	648	5,394	7,481	2,355	4,446	2,500*	6,145	73,902

*Estimated. †U. K. figures show gross imports, not net imports. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

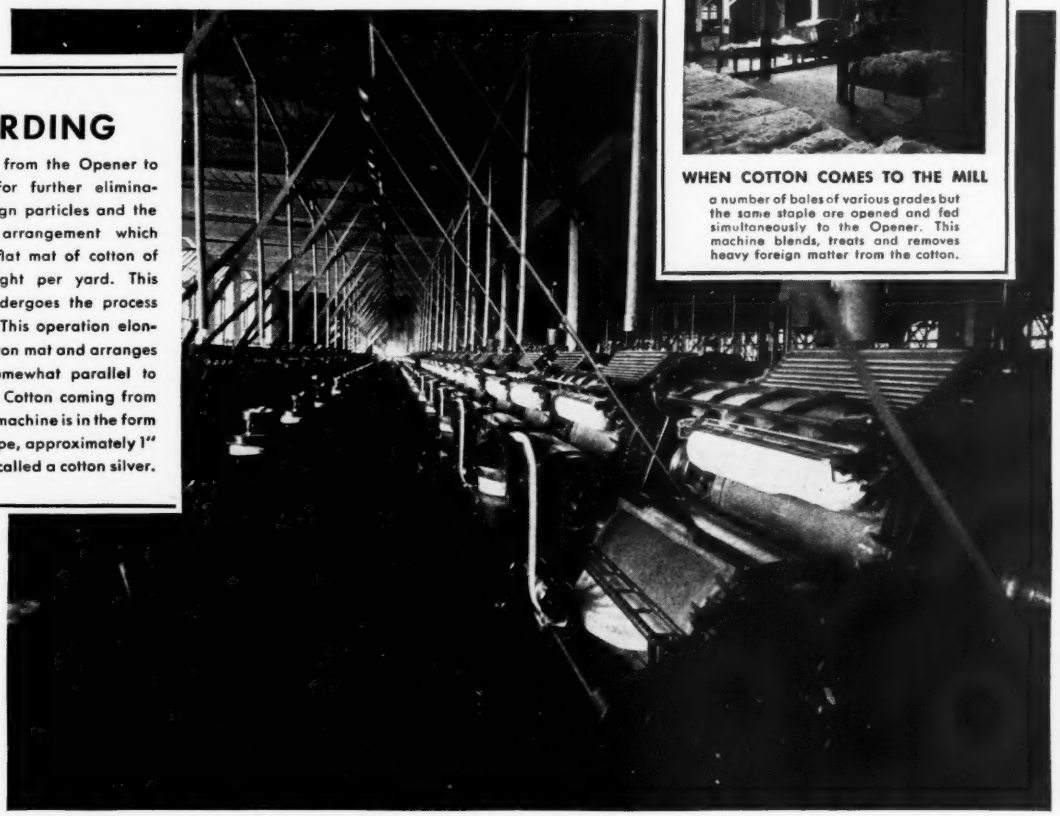
HOW COTTON FABRICS ARE MADE . . .

WHEN COTTON COMES TO THE MILL

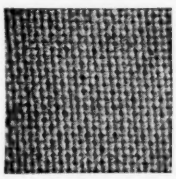
a number of bales of various grades but the same staple are opened and fed simultaneously to the Opener. This machine blends, treats and removes heavy foreign matter from the cotton.

CARDING

Cotton goes from the Opener to the Picker for further elimination of foreign particles and the mechanical arrangement which produces a flat mat of cotton of uniform weight per yard. This mat then undergoes the process of Carding. This operation elongates the cotton mat and arranges the fibres somewhat parallel to one another. Cotton coming from the Carding machine is in the form of a loose rope, approximately 1" in diameter, called a cotton silver.

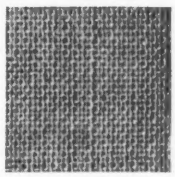


FABRICS FOR THE RUBBER INDUSTRY

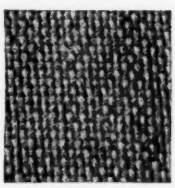


Shawmut Chafer Fabric

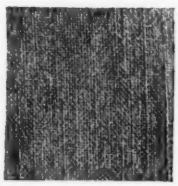
The extent of the Carding operations varies with different grades of fabrics. Repetitions of the process produce finer more uniform fabrics. Through years of practical experience in producing fabrics for the Rubber Industry we have been able to regulate these operations in our mills to the point where we can produce fabrics of the desired fineness and uniformity on the most economical basis. Our research laboratories and textile experts are at your disposal to work with you toward the solution of Rubber Fabric problems.



West Point Osnaburg



Shawmut Hose Duck



Columbus Sheeting

Shawmut Belting Duck

WELLINGTON SEARS COMPANY

65 WORTH STREET, NEW YORK, N. Y.

Tire Production Statistics

	Pneumatic Casings		
	Inventory	Production	Shipments
1937	10,383,235	53,309,973	53,485,388
1938	8,451,390	40,182,392	42,330,072
1938			
Jan.	10,801,278	2,696,566	2,448,308
Feb.	10,559,277	2,155,798	2,290,800
Mar.	10,520,813	2,679,735	2,794,956
Apr.	10,141,489	2,659,637	3,143,320
May	9,520,589	2,662,623	3,290,968
June	8,470,304	3,036,012	3,928,590
July	8,040,603	3,286,864	3,869,661
Aug.	8,216,612	4,037,715	3,990,591
Sept.	8,022,430	3,915,873	3,887,604
Oct.	8,237,338	4,183,293	4,126,006
Nov.	7,924,114	4,139,484	4,405,158
Dec.	8,451,390	4,728,792	4,154,110
1939			
Jan.	8,932,245	4,581,380	4,163,005
Feb.	9,572,553	4,343,513	3,738,696

	Pneumatic Casings		
	Original Equipment	Replacement Sales	Export Sales
1937	22,352,601	29,886,326	1,246,461
1938	10,716,130	30,565,008	1,048,934
1938			
Jan.	659,133	1,693,602	95,573
Feb.	688,019	1,525,006	77,775
Mar.	841,202	1,874,931	78,823
Apr.	907,005	2,136,294	100,021
May	731,605	2,474,301	85,062
June	678,251	3,177,572	72,767
July	494,310	3,290,828	84,523
Aug.	266,315	3,645,967	78,309
Sept.	678,198	3,123,823	85,583
Oct.	1,287,497	2,729,683	108,826
Nov.	1,777,183	2,544,452	83,523
Dec.	1,707,413	2,348,549	98,149
1939			
Jan.	1,685,190	2,353,822	123,993
Feb.	1,472,356	2,159,901	106,439

	Inner Tubes		
	Inventory	Production	Shipments
1937	10,311,745	52,373,330	52,766,728
1938	8,165,696	37,847,656	40,292,614
1938			
Jan.	10,582,203	2,515,910	2,526,506
Feb.	10,579,029	2,216,047	2,216,234
Mar.	10,546,506	2,581,732	2,644,705
Apr.	9,916,731	2,258,350	2,859,618
May	9,265,034	2,324,772	2,974,386
June	8,336,891	2,797,107	3,729,936
July	7,723,018	2,935,936	3,518,959
Aug.	8,029,070	4,026,118	3,743,814
Sept.	7,859,472	3,831,829	3,979,910
Oct.	7,746,479	3,979,874	4,101,408
Nov.	7,664,597	4,029,312	4,137,702
Dec.	8,165,696	4,350,669	3,859,436
1939			
Jan.	8,068,700	4,097,759	3,935,652
Feb.	8,414,652	3,680,521	3,334,791

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

RUBBER SCRAP

WITH reclaim production at a fairly high level, the demand for scrap rubber during March was reported as being good and somewhat better than that of the preceding month. The current level of activity is expected to continue during April. Inner tubes, peelings, and solid tires led other grades in relative demand.

The market is firm, with several advances in price being quoted. The grades that strengthened their market position are: inner tubes with the exception of No. 2, compound; black peelings; solid truck tires; and certain mechanical grades. All other grades held unchanged at last month's levels. Scrap dealers feel that present prices are favorable in view of the relatively high level of crude rubber.

CONSUMERS' BUYING PRICES

(Carload Lots Delivered Eastern Mills)
March 24, 1939

	Prices
Boots and Shoes	
Boots and shoes, black....lb.	$0.01 /$0.01⅛
Colored .....lb.	.00¾/ .00⅞
Untrimmed arctics .....lb.	.00¾/ .00⅞
Inner Tubes	
No. 1, floating.....lb.	.08¾/ .09
No. 2, compound.....lb.	.03⅝/ .03¾
Red .....lb.	.03⅛/ .03¾
Mixed tubes .....lb.	.03⅛/ .03⅝
Tires (Akron District)	
Pneumatic Standard	
Mixed auto tires with beads .....ton	11.50 /12.00
Beadless .....ton	15.00 /16.00
Auto tire carcass.....ton	18.50 /19.50
Black auto peelings.....ton	18.00 /19.00
Solid	
Clean mixed truck.....ton	26.00 /27.00
Light gravity .....ton	31.00 /33.00
Mechanicals	
Mixed black scrap .....ton	15.00 /17.50
Hose, air brake	20.00 /22.50
Garden, rubber covered.ton	10.00 /12.50
Steam and water, soft..ton	10.00 /12.50
No. 1 red.....lb.	.02¾/ .03
No. 2 red.....lb.	.02¼/ .02½
White druggists' sundries..lb.	.03¾/ .04
Mixed mechanicals.....lb.	.02¼/ .02½
White mechanicals .....lb.	.03⅝/ .03¾
Hard Rubber	
No. 1 hard rubber .....lb.	.11 / .11½

RUBBER POISONS. W. Esch, *Gummi-Ztg.*, 52, 1300-301 (1938).

New York Quotations

(*Continued from page* 84)

Softeners (*Cont'd*)		
RPA No. 1.....lb.	$0.65	
2 .....lb.	.65	
3 .....lb.	.46	
Rubtack .....lb.	.10	
Tackol .....lb.	.085	/$0.18
Tonox .....lb.	.52	/ .61
Tonox D .....lb.	.75	/ .85
Witco No. 20 .....gal.	.20	
X-1 Resinous oil (tank car).lb.	.019	
Solvents		
Beta-Trichlorethane .....gal.		
Carbon bisulphide .....lb.		
tetrachloride .....lb.		
Industrial 90% benzol (tank car) .....gal.	.16	
Skellysolve .....gal.		
Stabilizers for Cure		
Laurex, ton lots .....lb.	.12	/ .14
Stearex B .....lb.	.10	/ .11
Beads .....lb.	.09	/ .10
Stearic acid, single pressed.lb.	.10	/ .11
Stearite .....100 lbs.	.09	
Zinc stearate .....lb.	.23	
Synthetic Rubber		
Neoprene Type E.....lb.	.65	
G .....lb.	.70	
GW .....lb.	.75	
H .....lb.	.78	
M .....lb.	.65	
Latex Type 57.....lb.	.30	
Varnish		
Shoe .....gal.	1.45	
Vulcanizing Ingredients		
Sulphur		
Chloride, drums .....lb.	.035	/ .04
Rubber .....100 lbs.	2.65	
Telloy .....lb.	1.75	
Vandex .....lb.	1.75	
(See also Colors—Antimony)		
Waxes		
Carnauba, No. 3 chalky....lb.	.37½	
2 N.C. .....lb.	.39¼	
3 N.C. .....lb.	.37½	
1 Yellow .....lb.	.4575	
2 .....lb.	.4425	
Montan, crude .....lb.	.11	

"1939 Yearbook." The Tire & Rim Association, Inc., Cleveland, O. 115 pages. Price $2. This book presents the latest standards and recommendations of The Tire & Rim Association, Inc., regarding: loads and inflations for tires, rim contours, tire and rim combinations, valve equipment, etc. All the data are in convenient indexed and tabulated form. The book classifies tires into the following groups: passenger cars, truck and bus, motorcycle, agricultural, grading and excavating, industrial, and airplane.

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Siam	French Indo-China	Philippines and Oceania Total	Philippines and Oceania	Liberia†	Other Africa	South America	Mexican Guayule	Grand Total
1936.....	353,700	309,600	49,700	8,600	5,800	8,200	21,000	34,600	40,800	832,000	1,600*	1,600	4,500	14,700	1,200	855,600
1937.....	469,900	431,700	70,400	9,800	7,200	13,200	25,900	35,600	43,400	1,107,100	1,600*	2,200	5,400	16,300	2,700	1,135,300
1938.....	372,046	298,127	49,528	8,441	6,737	9,512	17,792	41,080	58,518	861,781	1,971*	2,929	4,901	15,337	2,485	889,404
1938																
Jan.	30,998	26,468	5,222	841	538	1,307	3,485	2,897	6,088	77,844	138	501	415	938	538	80,374
Feb.	37,166	27,327	5,216	639	770	918	8	3,266	3,070	78,380	125	168	438	1,640	218	80,969
Mar.	33,567	31,269	3,834	532	703	853	1,564	2,837	3,213	78,372	159	108	501	1,883	150	81,173
Apr.	44,744	28,487	1,951	485	842	1,158	1,728	1,583	3,647	84,625	201	308	318	1,085	188	86,725
May	28,011	22,036	2,833	909	561	815	1,648	2,507	3,118	62,438	120	175	284	1,160	229	64,406
June	28,048	24,427	3,693	625	693	643	2,441	3,904	4,776	69,250	198	110	353	809	150	70,870
July	25,055	35,141	3,861	601	482	937	2 057	4,710	5,139	77,983	126	311	371	722	223	79,736
Aug.	33,618	23,056	4,401	647	306	728	965	4,793	3,840	72,354	204	125	500	1,118	250	74,551
Sept.	30,485	20,205	3,990	824	212	284	756	3,893	8,139	68,788	208	445	453	828	173	70,895
Oct.	25,788	29,882	4,893	832	279	1,075	1,612	4,438	3,638	72,437	128	222	460	1,650	126	75,023
Nov.	29,214	19,193	6,422	670	601	567	929	3,223	4,035	64,854	164	274	418	1,229	59	66,998
Dec.	25,352	10,636	3,212	836	750	227	599	3,029	9,815	54,456	200	182	390	2,275	181	57,684
1939						1,604	2,342	2,918	4,739	83,606	200*	250*	400*	1,812	250*	86,518
Jan.	24,393	38,600	7,123	772	1,115											

*Estimated. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

WORKS MANAGER — SUPERINTENDENT — AMERICAN — NOW employed in foreign country as works manager of principal tire and tube factory and technical adviser to several factories manufacturing upholstery cloth, raincoat materials, mechanical goods, footwear; thorough knowledge of latex chemistry, compounding, development, production, supervision, organize, train and handle labor efficiently; will accept position anywhere. Address Box No. 1066, care of INDIA RUBBER WORLD.

RUBBER CHEMIST—COLLEGE GRADUATE, AGE 31. Seven years' experience in compounding heels, soles, neoprene, and canvas footwear. Now associated as assistant chemist. Address Box No. 1068, care of INDIA RUBBER WORLD.

RUBBER CHEMIST, Ch.E. 1930. BRAKE LINING, TIRES, BATteries. Plant or Sales. Address Box No. 1075, care of INDIA RUBBER WORLD.

PRODUCTION EXECUTIVE, AMERICAN. WITH MANY YEARS' practical thorough experience in all phases of soft mechanical and hard rubber manufacture: Compounding, purchasing, processing, costing, selling, development. Good coordinator and diplomatic. Age 48. Address Box No. 1076, care of INDIA RUBBER WORLD.

PRODUCTION SUPERINTENDENT, NOW EMployed, desires change. 18 years' practical experience in the manufacture of calendered, wrapped, molded, and extruded products. Thorough knowledge of factory costs and maintenance, and successful record as labor manager. Address Box No. 1078, care of INDIA RUBBER WORLD.

SUPERINTENDENT OR ASSISTANT DESIRES CONNECTION with small progressive company. Intimate with all manufacturing details of following lines: belting, packing, hose, rolls, sponge rubber, friction tape, soles, heels, flooring, lathe-cut goods, extruded molded hard and soft rubber items, and druggist sundries. Competent to develop inexperienced help and develop new formulas. Address Box No. 1079, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

WANTED IMMEDIATELY RUBBER MAT SALESMAN. SUBSTANtial commission only. Product has many new selling features. Also manufacture patches. Write immediately for full particulars advising experience. Address Box No. 1067, care of INDIA RUBBER WORLD.

$2,500 SALARIED POSITION $15,000

OUR SYSTEM OF SEARCHING OUT SALARIED POSITIONS, hiding your identity, increases your salary commensurate with training and experience. For valuable information write Rubber Department, EXECUTIVE'S PROMOTION SERVICE, Washington, D. C.

ATTRACTIVE OPPORTUNITY WITH PROGRESSIVE CANADIAN rubber manufacturer for a man experienced in miscellaneous rubber mold design, production methods and labor-saving machinery. Man located in Canada preferred. Address Box No. 1069, care of INDIA RUBBER WORLD.

SUPERINTENDENT, EXPERIENCED FULL CHARGE QUARTERlining department of rubber factory. Give full details in first letter. Address Box No. 1071, care of INDIA RUBBER WORLD.

YOUNG RUBBER CHEMIST WANTED BY SUCCESSFUL MANUfacturer located outside of major rubber centers. Should have two or three years' experience in mechanical goods compounding. Give complete qualifications. Address Box No. 1073, care of INDIA RUBBER WORLD.

CHEMIST ABOUT 28 YEARS OLD, WITH KNOWLEDGE OF non-curing rubber cement, compounding rubber heels and soles. Prefer man employed at present. State age, education, experience, and salary expected. Opportunity for advancement. Address Box No. 1077, care of INDIA RUBBER WORLD.

BUSINESS OPPORTUNITIES

MR. H. HANDS, MANAGING DIRECTOR, ROTUNDA LIMITED, Denton, Manchester, England, arriving New York s.s. *Britannic*, April 30, 1939, located "Hotel Commodore," is prepared discuss Agency proposition for Raw Materials (wholly or partly manufactured) used in production of Covered Electric Wires, Masking, Sealing, and Medicated Tapes, Boots and Shoes. Being actual manufacturers would consider exclusive production proposition on Royalty basis.

RUBBER FACTORY IN MARYLAND WILL MAKE MOLDED RUBber articles for you. Address Box No. 1070, care of INDIA RUBBER WORLD.

FOR SALE: CONCRETE STEEL FULLY EQUIPPED TIRE plant, also suitable for mechanical goods. Experienced labor available. Address Box No. 1074, care of INDIA RUBBER WORLD.

FOSTER D. SNELL, INC.
Chemists—Engineers
Every form of Chemical Service
305 Washington Street **Brooklyn, N. Y.**

EDWARD FOX
LATEX TECHNOLOGIST
Research • Development
336 CANAL STREET NEW YORK, N. Y.

Where Needs Are Filled
The Classified Ad. Columns of INDIA RUBBER WORLD bring prompt results at low cost.

Deresinated and Precipitated Surinam
B A L A T A
Refined approximately 99%
Purer and cheaper than you can produce it and you avoid the ever present fire risk. Dependable deliveries. Sample on request.
HUNTINGDON MANUFACTURING CO.
MEADOWBROOK, PA.

CORONA GOLF BALL WINDING MACHINES
Used everywhere by manufacturers. Rented on a monthly basis in U. S. Sold outright in foreign countries.
Illustrated circular on request.
Corona Manufacturing Company
Mount Airy, Philadelphia, Pa., U. S. A.

MECHANICAL
MOLDED RUBBER GOODS
Sponge Rubber: Sheeted—Die Cut—Molded
We Solicit Your Inquiries
THE BARR RUBBER PRODUCTS COMPANY
SANDUSKY, OHIO

INTERNATIONAL PULP CO.
41 Park Row, NEW YORK, N. Y.
SOLE PRODUCERS
ASBESTINE
REG. U. S. PAT. OFF.

(*Advertisements continued on page* 91)

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	—January, 1939—		—January, 1938—	
UNMANUFACTURED—*Free*	Quantity	Value	Quantity	Value
Liquid latex (solids)....*lb.*	3,589,452	$599,927	3,135,524	$494,242
Jelutong or pontianak....*lb.*	1,887,393	203,753	1,338,625	224,443
Balata ....*lb.*	136,059	20,417	51,509	8,958
Gutta percha ....*lb.*	200,169	31,389	106,115	16,283
Guayule ....*lb.*	505,100	49,580	1,204,600	147,685
Siak ....*lb.*	.....	.....	11,200	1,178
Scrap and reclaimed....*lb.*	403,746	6,116	308,473	4,022
Totals	6,721,919	$911,182	6,156,046	$896,811
Misc. rubber (above), 1,000 *lbs.*	6,722	$911,182	6,156	$896,811
Crude rubber....1,000 *lbs.*	78,970	12,313,006	98,524	15,115,732
Totals ....1,000 *lbs.*	85,692	$13,224,188	104,680	$16,012,543
Chicle, crude ....*lb.*	2,687,502	$728,092	1,280,712	$404,446
MANUFACTURED—*Dutiable*				
Rubber tires ....*no.*	2,413	$3,602	1,639	$1,987
Rubber boots, shoes, and overshoes ....*prs.*	780	204	6,583	720
Rubber soled footwear with fabric uppers ....*prs.*	67,057	6,547	74,195	20,827
Golf balls ....*no.*	4,704	875	15,336	1,362
Lawn tennis balls....*no.*	57,216	5,101	66,984	4,936
Other rubber balls....*no.*	408,956	17,765	462,766	24,796
Other rubber toys....*lb.*	31,433	5,137	87,553	13,980
Hard rubber combs....*no.*	45,360	3,354	40,428	2,780
Other manufactures of hard rubber	.....	186	.....	3,185
Friction or insulating tape.*lb.*	10,139	4,190	10,250	617
Belts, hose, packing, and insulating material	.....	10,771	.....	4,657
Druggists' sundries of soft rubber	.....	2,249	.....	8,372
Inflatable swimming belts, floats, etc. ....*no.*	89,186	5,403	65,487	4,796
Other rubber and gutta percha manufactures....*lb.*	50,514	16,384	135,409	26,286
Totals	.....	$81,768	.....	$119,301

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ....*lb.*	1,048,892	$165,663	728,230	$118,514
Balata ....*lb.*	2,000	190	38,058	11,939
Other rubber, rubber substitutes and scrap....*lb.*	50,374	2,565	78,341	10,225
Rubber manufactures (including toys)	.....	405	.....	1,289
Totals	.....	$168,823	.....	$141,967

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ....*lb.*	1,676,054	$87,668	1,473,745	$83,136
Scrap ....*lb.*	7,696,354	98,121	4,427,588	76,311
Cements ....*gal.*	25,343	24,205	30,621	25,626
Rubberized auto cloth..*sq. yd.*	16,541	8,086	28,087	12,936
Other rubberized piece goods and hospital sheeting..*sq. yd.*	226,342	86,786	149,938	66,258
Boots ....*prs.*	2,933	7,242	19,528	38,438
Shoes ....*prs.*	3,010	2,626	7,027	5,636
Canvas shoes with rubber soles ....*prs.*	26,265	17,602	19,737	19,238
Soles ....*doz. prs.*	2,018	3,916	.....	.....
Heels ....*doz. prs.*	39,530	19,234	10,171	6,743
Soling and top lift sheets.*lb.*	74,909	12,351	28,207	6,621
Gloves and mittens..*doz. prs.*	5,225	11,793	5,488	12,908
Water bottles and fountain syringes ....*no.*	11,918	4,272	15,143	5,004
Other druggists' sundries...	.....	43,760	.....	41,617
Gum rubber clothing....*doz.*	28,924	32,343	29,240	38,210
Balloons ....*gross*	20,772	17,967	21,445	16,102
Toys and balls	.....	5,291	.....	4,989
Bathing caps ....*doz.*	1,776	3,475	1,648	3,220
Bands ....*lb.*	20,805	8,570	19,449	8,268
Erasers ....*lb.*	22,991	12,545	23,773	13,835
Hard rubber goods				
Electrical battery boxes.*no.*	23,428	14,716	23,477	15,937
Other electrical ....*lb.*	25,376	5,723	48,530	10,672
Combs, finished ....*doz.*	5,665	3,664	35,405	10,621
Other hard rubber goods..	.....	12,430	.....	15,897
Tires				
Truck and bus casings.*no.*	16,291	307,331	20,203	395,859
Other auto casings ....*no.*	53,361	642,991	56,704	510,935
Tubes, auto ....*no.*	62,880	87,966	58,403	85,098
Other casings and tubes..*no.*	5,735	50,092	4,578	26,991
Solid tires for automobiles and motor trucks....*no.*	86	3,102	416	9,927
Other solid tires....*lb.*	21,358	3,292	51,750	8,770
Tire sundries and repair materials	101,230	31,624	.....	53,942
Rubber and friction tape..*lb.*	40,520	13,743	78,046	19,930
Fan belts for automobiles.*lb.*	45,275	26,143	38,421	20,125
Other rubber and balata belts ....*lb.*	233,368	124,984	206,735	118,354
Garden hose ....*lb.*	44,778	8,852	50,699	9,440
Other hose and tubing....*lb.*	382,732	135,451	297,969	111,399
Packing ....*lb.*	91,552	43,625	92,348	46,653
Mats, matting, flooring, and tiling ....*lb.*	133,101	18,062	68,265	9,595
Thread ....*lb.*	36,984	31,631	18,120	12,617
Gutta percha manufactures.*lb.*	26,405	7,993	25,815	10,631
Other rubber manufactures..	.....	91,604	.....	93,754
Totals	.....	$2,172,872	.....	$2,082,183

Imports by Customs Districts

	—January, 1939—		—January, 1938—	
	*Crude Rubber		*Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	14,072,060	$2,337,973	7,717,932	$1,241,677
New York	46,886,292	7,324,430	76,523,080	11,482,170
Philadelphia	746,111	123,652	1,502,127	238,188
Maryland	1,449,860	202,297	2,227,171	356,881
Georgia	328,037	45,430	.....	.....
Mobile	978,335	144,333	4,250	745
New Orleans....	2,830,526	412,572	5,845,591	982,130
Galveston	22,400	3,455	90,000	16,597
El Paso	89,800	8,798	.....	.....
Los Angeles	14,532,205	2,196,818	7,070,552	1,118,941
San Francisco	749,370	117,363	350,038	55,621
Oregon	32,400	5,398	14,220	2,218
Ohio	.....	.....	208,411	37,238
Colorado	347,260	39,994	1,310,500	225,253
Totals	83,064,656	$12,962,513	102,863,872	$15,757,659

*Crude rubber including latex dry rubber content.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	INQUIRY
2581	Information wanted on reclaiming rubber and necessary machinery therefor.
2582	Suppliers of ground rubber.
2583	Manufacturers of prophylactics in the United States and Canada.
2584	Manufacturers of molds for bathing caps, hot water bottles, and gloves.
2585	Manufacturers of white rubber bumpers for toilet seats.
2586	Manufacturers of rubber buffing machines.
2587	Manufacturers of atomizer bulbs.
2588	Supplier of plastic rubber for making masks.
2589	Supplier of oil-resistant synthetic sponge rubber.
2590	Manufacturers of rubber bulbs for toy water pistols.
2591	Manufacturers of small hollow balls with a tiny hole.
2592	Manufacturers of rubber platens for multigraph machines.
2593	Manufacturers of machine for slitting and rewinding onto bobbins rubber strip $\frac{1}{32}$-inch wide as used in making golf balls.
2594	Buyers of scrap rubber.
2595	Manufacturers of large rubber bands, 18 inches in circumference by $\frac{1}{4}$-inch wide by $\frac{1}{32}$-inch thick.
2596	Suppliers of rubber band cutters.
2597	Manufacturers of dental rubber.
2598	Manufacturers of machinery to make cycle tires.
2599	Manufacturers of cuspidor mats.
2600	Supplier of Gibson Soap Powder.
2601	Suppliers of fabric for high-pressure hose, belting, and bicycle tires.
2602	Buyers of scrap rubber, especially in Ohio and New Jersey.
2603	Manufacturers of rubber suction cups.
2604	Manufacturers of sponge rubber for arch support pads.
2605	Manufacturer of rubber ski straps.
2606	Manufacturers of supplies for ornamenting balloons.
2607	Suppliers of guayule rubber.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	COMMODITY	CITY AND COUNTRY
§648	Industrial rubber goods....	Nantes, France
†649	Battery separators, 40,000 to 50,000..	Henslinki, Finland
§663	Garage equipment and tools....	London, England
†678	Storage batteries	Port-Tewfick, Egypt
†689	Automobile and truck parts....	Cluj, Rumania
‡706	Toys	Hamilton, Canada
‡708	Novelties and toys and rubber goods..	Baghdad, Iraq
†711	Rubber sheeting and elastic webbing..	The Hague, Netherlands
†712	Suspenders	Maastricht, Netherlands
†717	Automobile accessories and parts and tires	Roien, France
‡719	Automobile-tube vulcanizing kits....	Prague, Czechoslovakia
‡722	Automobile accessories and motorcycle accessories	Warsaw, Poland
†725	Tires	Istanbul, Turkey
†726	Insulating wire	Port-au-Prince, Haiti
*733	Automobile and bicycle accessories....	Calcutta, India
*734	Garters and suspenders	Alexandria, Egypt
†738	Insulators, tubing, and flexible conduits	Guatemala City, Guatemala
*759	Ebonite and rubber thread....	Nottingham, England
*768	Druggists' sundries, technical goods, and garden hose	Alexandria, Egypt
*791	Elastic belts	London, England
†801	Golf balls	London, Canada
†803	Novelties, toys, and stationery supplies	Ciudad Trujillo, Dominican Republic
*821	Airplane accessories and parts....	Warsaw, Poland
¶823	Automobile accessories and parts....	Toronto, Canada
*824	Airplane accessories and parts....	Rio de Janeiro, Brazil
‡827	Rubber goods	Cairo, Egypt

*Agency. †Purchase. ‡Purchase and agency. ¶Purchase or agency. §Exclusive agency.